MODERN Machine Shop

$2.00 Per Year

December, 1930

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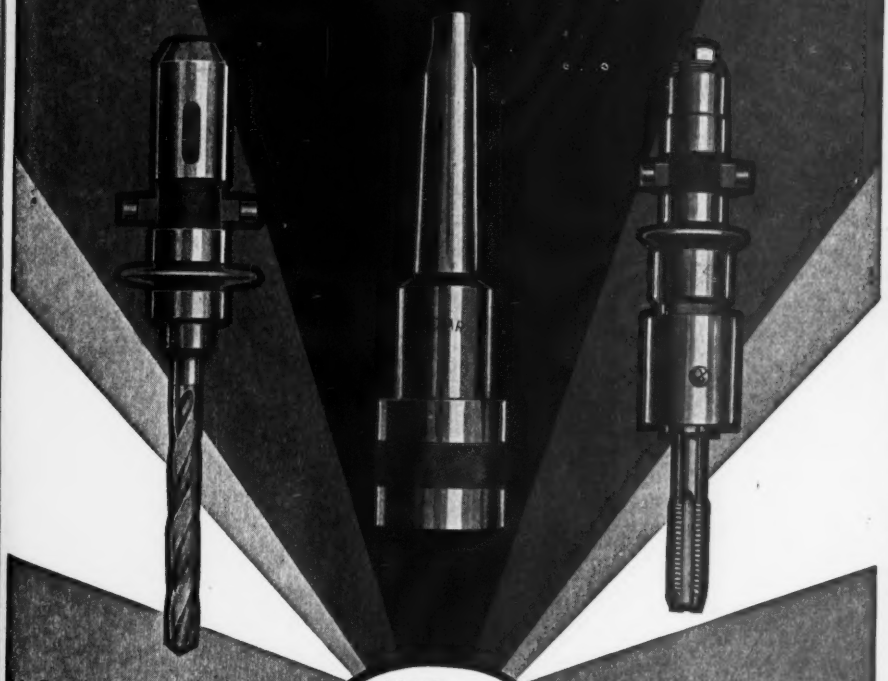

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ONLY four weeks of this year remain . . . for planning how to cut costs in 1931. So, there is no time to lose. Tackle this problem NOW.

¶ Decisions made now will largely determine whether 1931 is a "good" year or a "bad" year for your organization . . . free from difficulties or full of worries, with satisfactory profits or heavy losses.

¶ Overhead looms more important than ever, with the trend toward shorter hours and fewer days per week . . . and anything that cuts overhead and lowers inventory represents real gain. Soaring consumption and disappearing markets—demands that vanish as suddenly as they come—introduce still other problems for the executive charged with production, yet responsible for minimizing expense.

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¶ Over 5,000 concerns are cashing-in upon Danly Service . . . so valuable where costs must be cut, so indispensable where speed is vital and such a short cut when increased production is urgent. And it is so convenient.

¶ A telephone call or telegram will bring full information . . . or one or a carload of die sets, should you need them. Your die sets are ready, in stock, right now!

¶ Danly can serve you well, in vital ways, during 1931. Until you use Danly Service you have not cut costs as much as you could, nor eliminated much unnecessary detail and delay.

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Photograph in panel below shows interior view of improved Hisey drill. Compare the construction point for point with any other drill.

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EACH year the sales of Hisey Electric Drills have shown a very substantial increase. Many customers who bought one or two Hisey Drills at first have re-ordered time and time again. Scores of the largest manufacturers in the country have standardized on Hisey Drills. Why?

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Use Starrett Hacksaws

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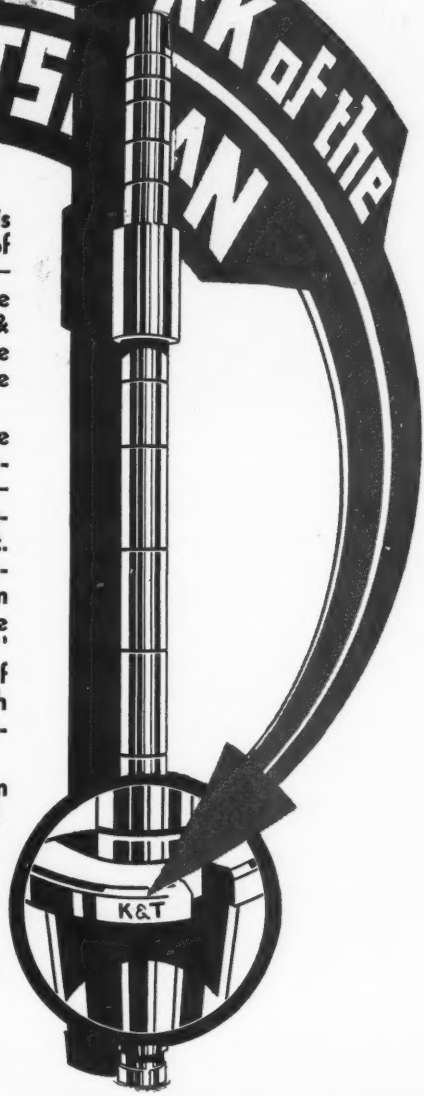
THE MARK of the CRAFTSMAN



JUST as the artist affixes his name to his completed canvas as a final gesture of approval, so are the initials—"K&T"—stamped deeply into the rim of the driving collar of every Kearney & Trecker Arbor, as the mark of the craftsman who takes keen personal pride in his handiwork.

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Cincinnati Plain Self-Contained Grinder accurately finishing sleeves in 30 minutes.

Accuracy At Low Cost

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A comparison of the performance of your present machines with what users are obtaining from modern Cincinnati Cylindrical Grinders may reveal that you can actually afford to scrap your old machines and operate a new Cincinnati at a handsome profit.

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Without obligation, send us
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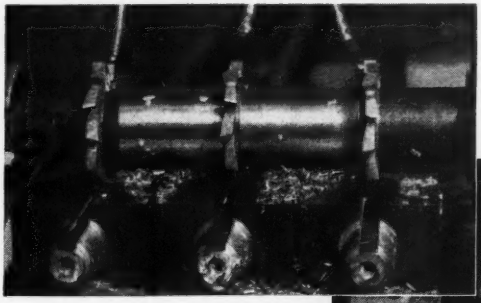
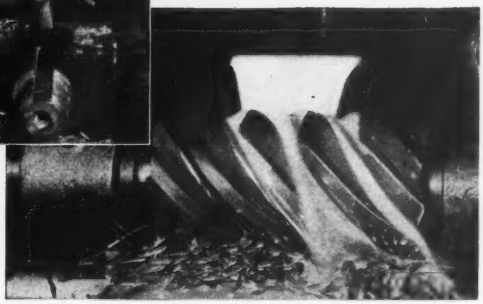
Cutters, to be economical, must be designed and manufactured to stand up on heavy cuts for long periods of time with few sharpenings. Each sharpening causes expensive delay in machine operation and loss of man time. Cutters, according as they may be good or bad, make savings or excessive costs in production; their influence is far greater than their relatively small purchase price would indicate.

The ability of Brown & Sharpe Cutters to stand up on heavy work—to take more cuts between sharpenings—makes them the best to use on every job. They give lowest *real* cutter cost. Ask for Catalog No. 31 listing the complete line of Brown & Sharpe Cutters. Brown & Sharpe Mfg. Co., Providence, R. I.





B·S

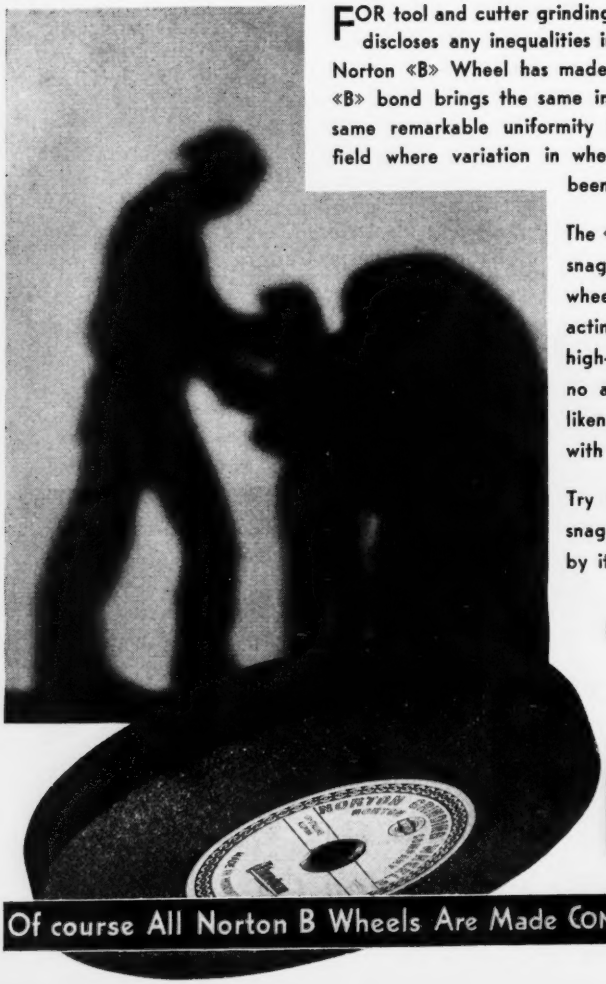
Brown & Sharpe Cutters

Lower Production Costs

Overshadowing

Even its Success for Tool Grinding . . .

The Norton «B» Wheel Now for Snagging



FOR tool and cutter grinding—work which most readily discloses any inequalities in wheel performance—the Norton «B» Wheel has made a name for itself. Now «B» bond brings the same improved performance, the same remarkable uniformity to the snagging field—a field where variation in wheel performance has often been accepted as unavoidable.

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NORTON COMPANY
Worcester, Mass.

W-331

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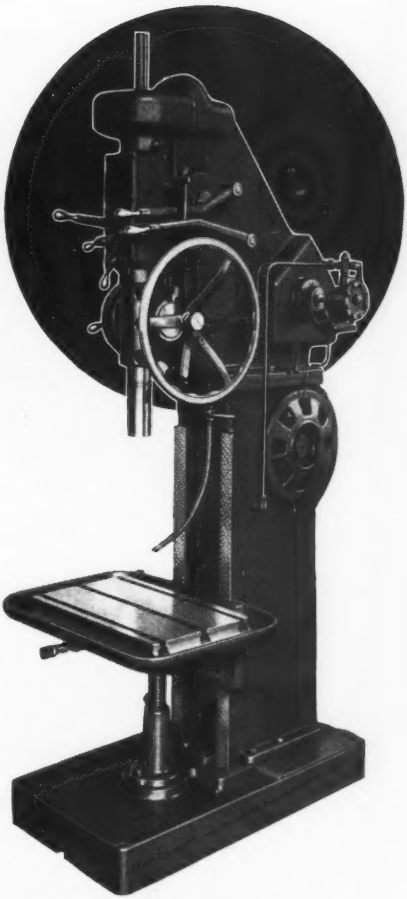
Of course All Norton B Wheels Are Made CONTROLLED STRUCTURE

ANOTHER NEW SELF-OILING ALL-GEARED DRILLING MACHINE NO. 201



Progress—forward thinking—anticipation of market needs and user demands created the new No. 201 Self-Oiling, All-Geared Drilling Machine. It drills to 1″ diameter and swings 20″, like our recently-announced S-201, *and has six quick-change speeds and six quick-change spur-geared feeds.* The S-201 is for single purpose high-production applications. The new No. 201 is for *general purpose high-production work.* It meets every requirement of modern manufacturing by utilizing to the utmost the best qualities of the new high-speed cutting tools.

The new No. 201 resembles our well and favorably known Nos. 221½ and 242 in appearance and *performance.* Its advantages, details of construction and specifications are listed in a new bulletin—send for it—study it—check up your drilling equipment, you may find that you can make new profits with this new machine.

WRITE TODAY FOR BULLETIN 201U » »

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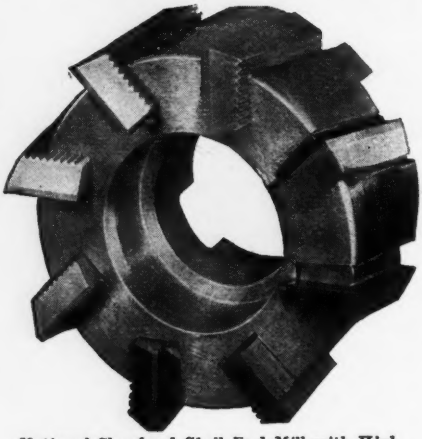
NATIONAL-CLEVELAND

Inserted Serrated Blade Cutters



National-Cleveland Shell End Mill with High Speed Steel Inserted Serrated Blades.

This line includes Shell End Mills, Face Milling Cutters, Alternate Tooth Cutters, Straddle Mills and other cutters of special design. Bodies are made from special heat treated alloy steels; blades made of high speed steel, hardened and ground.

Cutters with Stellite or Tungsten Carbide Blades can be furnished on request.

Some of the advantages of the National-Cleveland Inserted Serrated Blade Cutters over the old type Inserted Blade Cutter with plain back blades and round wedge pins are:

Blades are locked in position more securely.
More blade adjustment, resulting in longer life.
Quicker adjustment or replacement of blades.
Lower cost of maintenance.

We will be glad to co-operate with you on cutter needs.

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Manufacturers of **National-Cleveland** Machines and Cutting Tools

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MODERN Machine Shop
REG. U. S. PAT. OFF.
A Magazine for Machine Shop Executives
HOWARD CAMPBELL, Editor

Vol. 3 DECEMBER, 1930 No. 7

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Guaranteed circulation this issue, 27,500 copies

Published Monthly at 128 Opera Place, Cincinnati, Ohio, by
DON G. GARDNER, Publisher and General Manager

GEORGE H. MEYERS, *Western Manager*, Chicago
DON L. PROUTY, *Central-Western Manager*, Detroit
H. I. CIRCLE, *Eastern Manager*, New York

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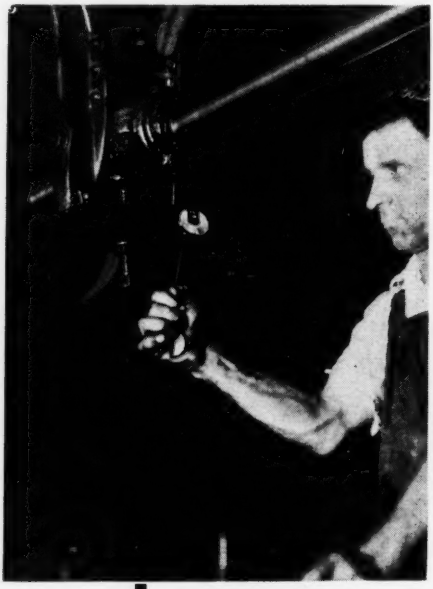

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Write for Catalog B-27. Shows, describes and prices all ARMSTRONG Tools.

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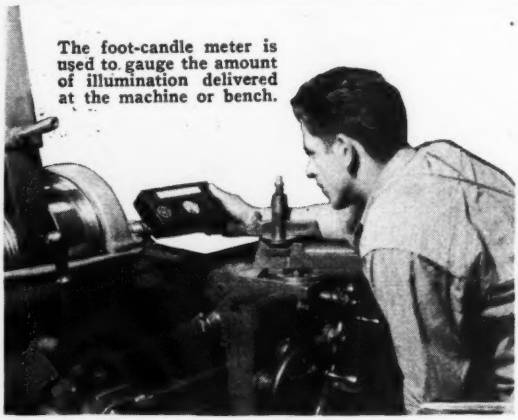
TRADE MARK REG. IN U.S. PAT. OFFICE

MODERN Machine Shop

DECEMBER, 1930

CINCINNATI, OHIO

VOL. 3, NO. 7



The foot-candle meter is used to gauge the amount of illumination delivered at the machine or bench.

Lighting the Machine Shop

By DEAN M. WARREN,
General Electric Company

THOSE who are responsible for factory operation and efficiency no longer lift a quizzical eyebrow when illumination is mentioned as a necessary factor for successful plant operation. Thousands of executives have come to appreciate its relationship to efficiency, reduced shrinkage, decreased cost of production and many other features not so easily evaluated but nevertheless contributing factors which have a definite bearing on successful operation.

The machine shop manager is primarily interested in good lighting as it relates to production, but such factors as accidents, lower shrinkage, a neater and cleaner plant as well as a higher morale among his employees are in some cases as valuable from the monetary point of view as increased production. They are, however, more difficult to evaluate, but their worth unquestionably will justify the installation of a lighting system of the most modern design.

The subject of artificial lighting is receiving a continually-increasing amount of attention, and a number of tests have been made in actual factories under various levels of illumination. In the Timken Roller Bearing Company a test was conducted over a period of three months to determine the time required for inspection of roller-bearing parts under various levels of illumination from 5 to 20 foot-candles. The "foot-candle" is the standard unit for the measurement of light and is considered as the amount of light received at a given point from one candle at a distance of one foot. The following table shows the results:

Foot-Candles	Per Cent of Increased Production per Employee	Cost of Light in Per Cent of Payroll
5 (old system)	...	0.3
6 (new system)	4.0	0.8
13 (new system)	8.0	1.6
20 (new system)	12.5	2.4

This table indicates quite clearly that as the intensity is increased, there is a corresponding increase in production without the addition of more men or equipment.

Adequate lighting is as important as other equipment. Here a shop is shown lighted in the modern manner, using 200-watt lamps, spaced 10 x 10 ft. at a height of 10 ft. Foot-candles delivered, 13.

The Detroit Piston Ring Company ran tests over a 15-month period, increasing their intensities to 18 foot-candles. This meant an additional cost amounting to 2 per cent of the payroll, but their production was increased 25 per cent.

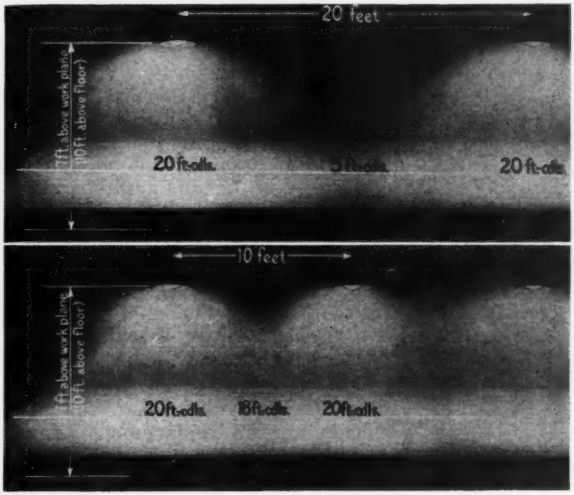
Such evidence of what good lighting will do—and it is piling up every day—might well be dismissed with a wave of the hand, if these reports dealt simply with providing light in dark areas which had not previously been lighted. Such was not the case, for in the majority of instances fair average conditions of artificial illumination prevailed initially and the benefits were obtained simply by improving the character and quality. The lighting of a factory is no longer a responsibility in the janitor class of duties. The machine shop manager, who is usually familiar with the workings of each department and the problems pertaining to each, should also be familiar with what good lighting is as contrasted with bad lighting, what good lighting consists of and what are the lighting requirements of his particular plant. Then will he be able to specify proper lighting and supervise its maintenance, so that every benefit which ordinarily would be derived is received.

Let us therefore consider a few of the reasons for the need of better lighting in the factory and what are some of the fundamentals which make good lighting as important as other accepted factors in economical plant operation.

These 300-watt lamps, mounted at 12 ft. and spaced 10 x 12 ft., deliver 18 foot-candles. This is a high level of illumination.

The fact that the average plant is not in operation at night may lead the

executive to believe that his present system is acceptable. Careful investigation will show, however, that even in modern plants, where provision has been made for plenty of daylight, there are places where daylight is not sufficient in quantity to insure good vision. Furthermore, during the winter, which is frequently a busy season, there are early morning and late afternoon hours and many cloudy days when artificial light is needed to supplement daylight. In old buildings, where little provision has been made for daylight, the need is even greater.



A graphic presentation of the importance of proper spacing.

The amount of daylight received decreases rapidly as the distance from the windows is increased, which has led to the common practice of locating machines along the windows. Areas in the center of the room then become used only for storage or other inactive purposes, chiefly because of the lack of sufficient light. Where rentals are high, these storage areas increase production costs. A well-designed lighting system will supply uniform illumination throughout the room, thereby increasing the value of the space farther from the windows and permitting the arrangement of machines according to continuity of process.

If better factory lighting increases production—and if inadequate lighting causes accidents, increases spoilage and lowers morale—why should any factory manager tolerate less than the best? There can be but one answer to this question: that lack of adequate lighting is not always apparent. Indeed, so far as ordinary conditions of vision are concerned, factory officials very often are satisfied until a fresh point of view is taken and comparisons are made—not with yesterday's, but with today's standards.

Even satisfactory initial design is not a guarantee of permanently good lighting. Workmen may have used the wrong sizes or types of lamps to replace burn-outs. Because of lack of convenient outlets, a lighting outlet may be utilized to attach an extension cord, reducing the illumination in the area originally served by that unit, together with the possibility of overloading that branch of the circuit.

Neglect, as well as lack of information as to what constitutes good lighting, is responsible for below-par illumination.

The simplest and easiest way of checking up on any lighting system is by the use of a foot-candle meter—a compact little instrument of about the same dimensions as an ordinary cigar box and weighing about three pounds. It can easily be carried around from one workbench or machine to another

and the amount of illumination received quickly and fairly accurately measured. A survey of this sort will point out wherein your illumination falls below par.

In considering the efficiency of your present system, or if you plan on installing new lighting, the first thing to be considered is wiring. The value of

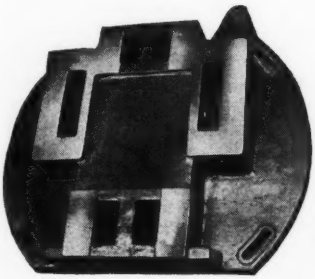
By moving the outer row of units closer to the wall, adequate illumination is provided for the work benches.

voltage that will be actually available at the socket is too uncertain and plays too important a part in the performance of an incandescent lamp to leave it out of consideration in making a lighting layout. A change of one per cent in voltage changes the light output about 3.4 per cent. A difference of 5 volts will result in a difference of about 18 per cent in light output and this lost light is of a much better color quality than that remaining, which becomes more and more yellow as the voltage is reduced and the filament temperature drops.

If the average voltage delivered at your service switch is too low, it should be corrected. Ordinarily the voltage should be maintained several volts above the nominal circuit value at the service switch, to allow for the drop in voltage in your plant circuit which should be expected to run not less than two or three volts when the average lighting load is on. Such low values can only be obtained with an excellent wiring job; with ample copper in feeders and branch circuits. In many cases, particularly in industrial and commercial service, the wiring drop will be found to run considerably over three volts, due perhaps to excessively long runs which have been selected only with regard to safe carrying capacity, to poor contacts in fuses and switches, and to poorly-designed or overloaded branch circuits. The best procedure in such cases is to correct the conditions by rewiring branch circuits, by installing additional feeders, and by a systematic overhauling or replacement of fuse blocks, switches, and so on.

There are three methods of lighting which find application in the machine shop; so-called "local" lighting with drop cords or small lights on individual machines; general, or overhead lighting, and concentrated lighting or "lighting plus." A lighting system which consists entirely of local units suspended over individual machines is to be shunned; true, such a system usually means a high intensity of light immediately on the work, but there is too great a brightness in contrast with the surroundings. The eye is forced to adjust itself to a different brightness every time the worker looks up from his operation and this will eventually cause eyestrain. Today this method has been largely superseded by general overhead lighting, due to the fact that it relieves brightness contrasts, brightens up the shop, makes supervision easier and promotes a more sanitary condition.

Compare these Actual Figures!



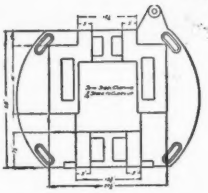
Cost of Finishing this Cast Iron Turret

-by ordinary machining $2.10
-by Bridgeport Face Grinding . . 0.37

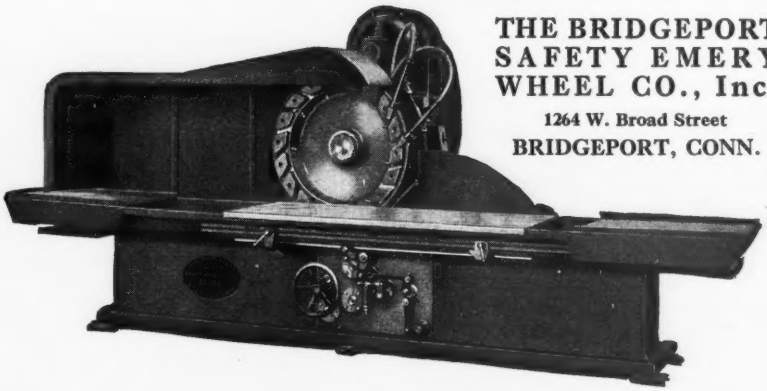
WHAT more convincing proof of the economy of Bridgeport Face Grinders—a saving in machining cost of more than 82½% *plus* a better and far more accurate finish. And this economy is typical.

Bridgeport's powerful hydraulic "Oilgear" table is capable of any speed up to 85 feet per minute; spindle is Timken Bearing equipped and driven by a silent oil bathed chain. Standard equipment includes 26", 32" or 42" Bridgeport Sectional Grinding Wheels.

Let us prepare estimates showing exactly how Bridgeport Face Grinding will save you money on your finishing work. Write today.



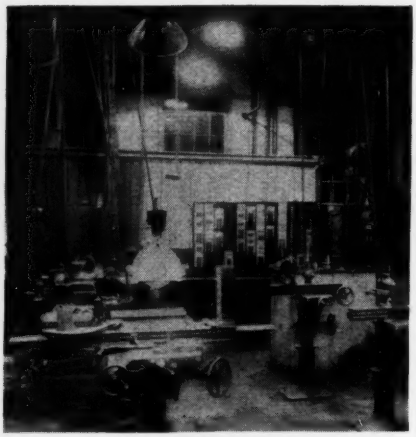
Floor Grinders, Tool Grinders, Knife Grinders, Shear Blade Grinders, Face Grinders, Swing Frame Grinders, Radial Grinders, Wet and Dry Grinders, Slitter and Disc Grinders, Die Grinders, Buffing and Polishing Lathes—and many special grinders. A complete line of high grade grinding wheels to meet every need.



THE BRIDGEPORT SAFETY EMERY WHEEL CO., Inc.
1264 W. Broad Street
BRIDGEPORT, CONN.

BRIDGEPORT

General, or overhead lighting, consists of light sources mounted overhead and insofar as possible symmetrically arranged, usually according to bays, to produce approximately uniform illumination throughout a given area. If properly designed, such lighting makes possible good vision in any location or position, and, where overhanging machine construction does not prevent, is the ideal method of industrial lighting. However, where extremely fine work is being done, the high intensity or direction of light necessary may require the use of local lights, but they should always supplement the general illumination.



A high intensity of illumination for fine operations may be obtained by mounting a high wattage lamp and reflector near the ceiling, as shown in this illustration.

In certain operations in the machine shop, particularly where fine die work is being done, it is often quite necessary that a high intensity of lighting be had. This simply means that more light is piled up on certain areas than they would receive from the general overhead system and is accomplished by means of floodlights or high intensity units, usually mounted at or near the ceiling and so directed as to build up the intensity where desired. This system, which is known as "lighting plus," has practically all of the advantages of the old drop light in getting the light where it is most needed, and yet the lighting units are out of reach of meddlers.

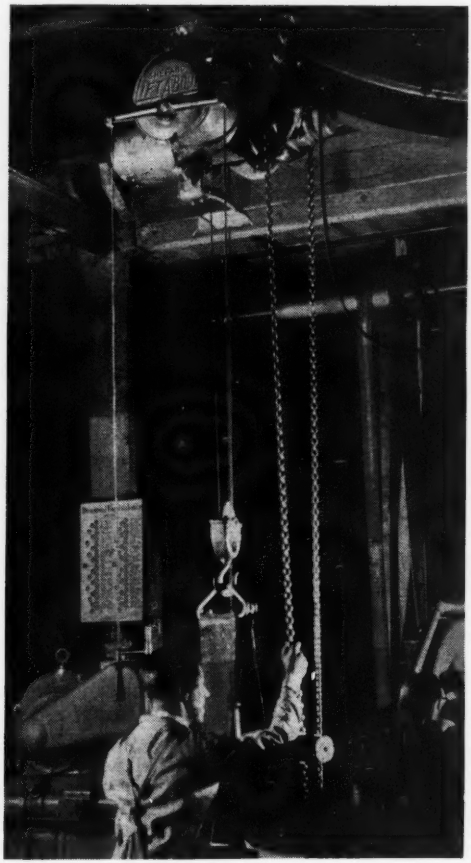
The type and style of reflecting equipment used are important; permanence, durability, efficiency and ease of maintenance being essential requirements. The RLM Standard Dome Reflector is the most widely used type of reflector for general lighting. It gives a very desirable distribution of light over horizontal surface with illumination on vertical surfaces. It is efficient, easy to clean, and so designed that direct glare is reduced to a satisfactory medium, especially when a white bowl lamp is used. The Glassteel Diffuser gives a softer light. It is composed of two parts; an enlarged enameled steel reflector to direct the light downward and an enclosing opal globe which fits under the steel reflector. This enclosing opal globe provides an enlarged light source area, thereby greatly diffusing the light and softening the shadows. Perforations in the top of the steel reflector allow a small amount of light to travel upward, illuminating the ceiling, belts, shafting, and so on. The high bay unit is used where high ceilings are encountered. It differs considerably from the above mentioned units in its construction, thereby making possible a more concentrated distribution of light and avoiding undue waste in the sidewalk.

There are four levels of illumination, as follows:

5-10 foot-candles — Satisfactory for work of a coarse nature, such as rough bench and machine work.

10-15 foot-candles—Considered good

Machine assembly
IS SPEEDED BY PRECISION HANDLING



EFFORTLESSLY, the mechanic lifts the heavy parts into place. Quickly, and with unrivalled precision, the massive gear cutters and shapers are assembled. The 15 Shepard Electric Hoists mounted on jibs are saving hundreds of dollars worth of time and have made pleasant work of back-breaking labor at the Gould and Eberhardt plant.

In machining, too, full advantage has been taken of Shepard's Planned Load Handling. Heavy casting, gears and shafts are handled as easily as toys by the Shepard Electric Hoists on single I-beam cranes, or suitable monorail track. Machines are kept busy—the Shepards are always ready when needed.

Each hoist is precisely suited to its work—because Shepard builds a most complete line of types and sizes from which to choose. Every hoist has the "balanced" drive, automatic oil bath lubrication, complete enclosure of all vital parts and precision control — features that assure new hoist performance year after year with a minimum of maintenance.

Typical savings through the use of planned overhead load-handling are given in the book of "Illustrated Economies." Write for a copy.

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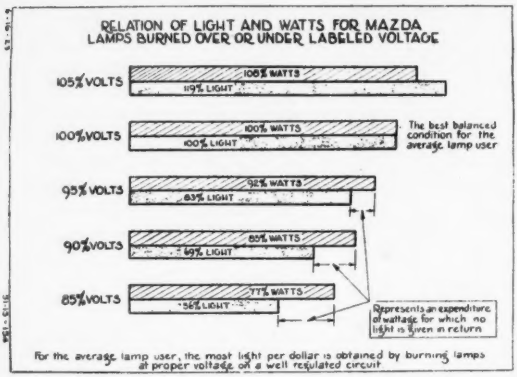
light for most kinds of work on light-colored surfaces and for fairly close work on dark colored surfaces. Satisfactory for medium bench and machine work, ordinary automatic machines, rough grinding, medium buffing and polishing.

15-25 foot-candles—Really excellent lighting. In addition to permitting quick and accurate execution of all work except the most exacting, lighting of this kind stimulates the workmen and makes for fast and accurate operation. Highly satisfactory for fine bench and machine work, fine buffing and polishing and medium grading.


RELATION OF LIGHT AND WATTS FOR MAZDA LAMPS BURNED OVER OR UNDER LABELED VOLTAGE
105% VOLTS
106% WATTS
119% LIGHT
100% VOLTS
100% WATTS
100% LIGHT
The best balanced condition for the average lamp user
95% VOLTS
92% WATTS
83% LIGHT
90% VOLTS
85% WATTS
69% LIGHT
85% VOLTS
77% WATTS
56% LIGHT
Represents an expenditure of wattage for which no light is given in return
For the average lamp user, the most light per dollar is obtained by burning lamps at proper voltage on a well regulated circuit

This graph shows what happens when lights are burned under voltage.

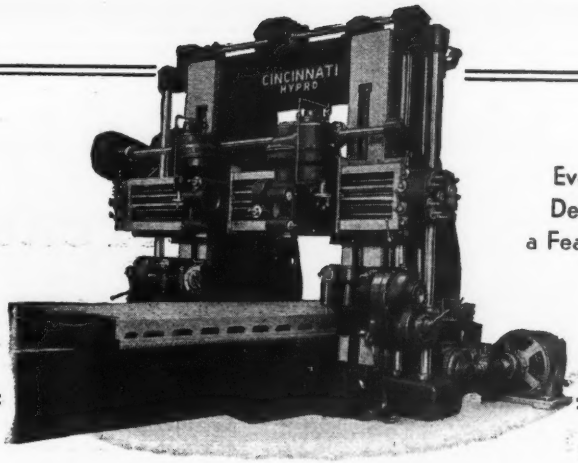
50-100 foot-candles—Necessary only in extremely fine, accurate operations and in inspections of very fine details. Usually employed locally and supplemented by general lighting of lower value. Such intensity is needed only for extra fine bench and machine work.

The basis of design of a general lighting system is based largely on the desirability of uniform illumination throughout the entire area. To produce these results, it is necessary that lighting units be mounted fairly high. Too great spacing between units will result in uneven illumination. This can be remedied, either by raising the units, where the ceiling height permits, or by the installation of additional ones. It is apparent that to get uniform illumination, it is necessary to maintain a certain ratio between spacing and mounting height. With the modern types of lighting units, the spacing should not materially exceed the distance between the floor and the bottom of the unit.

Experience has shown that in a great many cases one-half of the light paid for is thrown away through the lack of attention to simple maintenance requirements. Reduced illumination due to poor maintenance means increased production cost, additional spoilage, and more accidents. In checking over your system be sure and note the following: dirty reflectors and lamps; darkened walls and ceilings; lamps of poor quality; empty sockets, and unobserved burnouts and undervoltage burning of lamps. The services of soaps and water should be signed up in advance as a protection against the accumulation of dirt, and the washing of lighting units should be put on a regular monthly schedule.

The cleaning of any lighting units will be made easier by suspending the reflectors from hooks, with separate plugs for the electrical connections. A hook suspension makes it unnecessary for the maintenance man to carry his cleaning equipment up a stepladder. He goes up the ladder with a clean lighting unit, installs it in place of the dirty one, and carries the dirty one down for cleaning. With a solid floor under his feet he does a much better and quicker job of cleaning. For out of the way places, difficult to

(Continued on page 48)



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- Independent Rapid Traverse to All Heads
- Independent Power Feed to All Heads, Rail and Table
- 75 Feed and Spindle Speeds.

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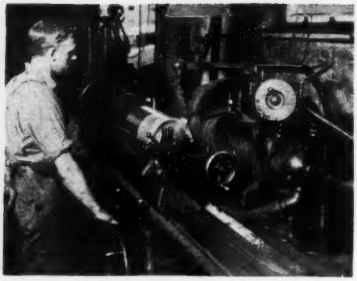
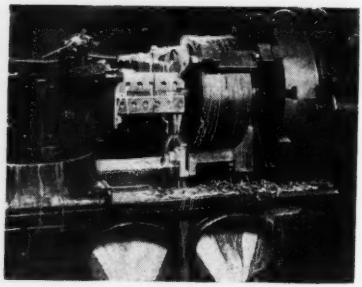


Courtesy of Carborundum Company, Niagara Falls, N. Y.

OPERATION: GRINDING STEEL ROLL, 9 IN. DIAMETER, 18 IN. LONG
MACHINE: LANDIS ROLL GRINDER, 12 IN. X 72 IN.
SCLEROSCOPE: 94 TO 101.
WHEEL ROUGHING: 36-9-C9R
FINISHING: 120-6-C6Y.
POLISHING: 400-10-C10Y
18 IN. X 1½ IN. X 8 IN.
METAL REMOVED: ROUGHING .0015 IN. PER PASS. FINISHING .0005 IN. PER PASS. TOTAL AMOUNT OF METAL REMOVED .005 IN.
WHEEL SPEED: 1700 R.P.M
WORK SPEED: 40 R.P.M.
LUBRICANT: 1 PART SUNOCO TO 30 PARTS WATER



Courtesy of Bates-Wohlert Company, Lansing, Michigan

OPERATION: BORING 15 IN. STARTER GEAR BLANKS
MACHINE: LIBBY LATHE.
MATERIAL: .50 CARBON STEEL
FEED: ⅛ IN.
SPEED: 130 S.F.P.M
LUBRICANT: 1 PART SUNOCO TO 20 PARTS WATER

Machine shop executives, alert for means to shorten machining time, find the real solution in a better cutting fluid—Sunoco Emulsifying Cutting Oil.

A significant tribute to Sunoco is its increasing use by machine tool builders, steel plants, gear manufacturers and the automotive industry. It has been chosen after exhaustive tests of every factor that contributes to machine performance.

Sunoco reduces time lost in frequent tool re-sharpenings; it decreases rejections, and as a consequence the production of accurate work increases even though speeds and feeds remain the same.

It is an easily substantiated fact that many users have increased production by higher spindle speeds and feeds—with the same precision and quality of finish as at lower speeds.

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and Finish — *while* Production

With Sunoco, deeper and faster cuts are possible, production increased, work is kept cooler, tool life lengthened, machines and finished parts are protected from rust and corrosion, systems require cleaning out and replenishing only about half as often, and its net cost is less.

It is perfect in its emulsion; will not separate. It is hygienic, containing no animal or vegetable fats to become rancid after prolonged use. Cuts on workmen's hands will never become infected.

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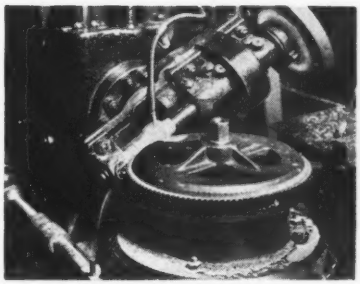
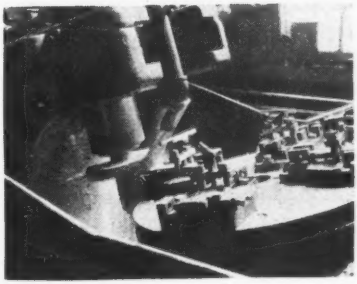
Courtesy of Bates-Wohlert Company, Lansing, Michigan



OPERATION: CHAMFERING STARTING GEAR TEETH.
MACHINE: FARWELL HOBBING MACHINE.
MATERIAL: .50 CARBON STEEL.
NUMBER OF TEETH: 110.
CUTTER SPEED: 150 R.P.M.
LUBRICANT: 1 PART SUNOCO TO 15 PARTS WATER.

Courtesy of Columbia Axle Company, Cleveland, Ohio



OPERATION: MILLING BEARING CAP.
MACHINE: OESTERLEIN HEAVY DUTY MILLER.
MATERIAL: MALLEABLE IRON.
SPINDLE SPEED: 28 R.P.M.
CUTTER SIZE: 10 IN. DIAMETER 1½ IN. FACE 2 IN. BORE.
CUTTER SPEED 73 S.F.P.M.
STOCK REMOVED: .0625 IN.
CUTTING LUBRICANT: 1 PART SUNOCO TO 16 PARTS WATER.

This Plant Specializes In Crankshaft Production

By DONALD A. CLARK

THE crankshaft is an important part of an engine—particularly in the case of an internal combustion engine. The design, the selection of the steel, the particular kind of heat treatment that will develop this steel to its highest point of efficiency, machining methods that will produce a finished piece within practicable limits of cost—all of these factors combine to make the production of crankshafts a task for specialists, such as the Union Drawn Steel Company of Beaver Falls, Penna. This company has been making crankshafts for more than twenty-five years, and is completely equipped for turning out crankshafts of any description on a production basis. The illustrations in this article will serve to show some of the methods and equipment in use in this plant.

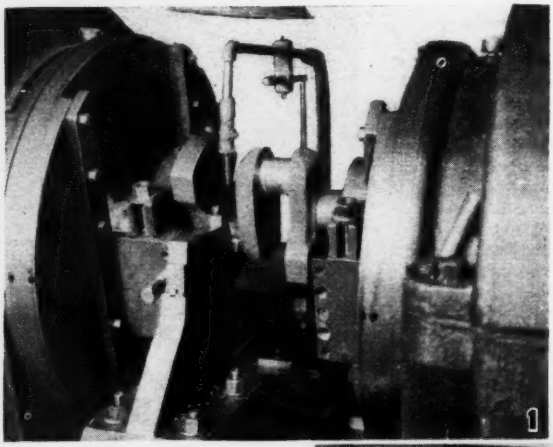
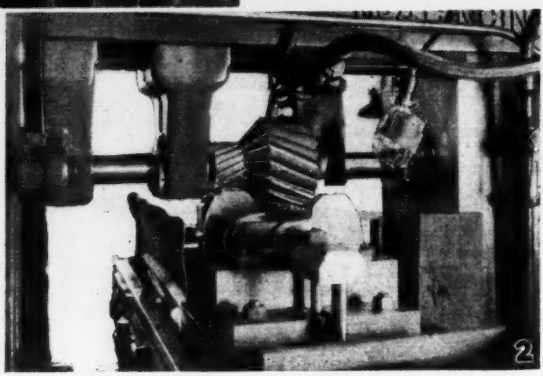


Fig. 1—Turning the crankpins on a crankshaft for a Curtis-Wright "Challenger" aircraft motor. Fig. 2—Milling the sides of the web on a "Challenger" shaft.



One of the first operations on a crankshaft is that of facing the web and turning the crankshaft "pins" or connecting rod journals. Figure 1 shows a special crankshaft machine in operation, turning the pins and facing the cheeks on shaft for a Curtis-Wright "Challenger" airplane motor. The shaft is clamped at both ends, the faceplates being geared to revolve together. A tool of the exact width required is used to obtain the clearance between cheeks, and the pin is turned to .060 in. over the finish dimension, the re-

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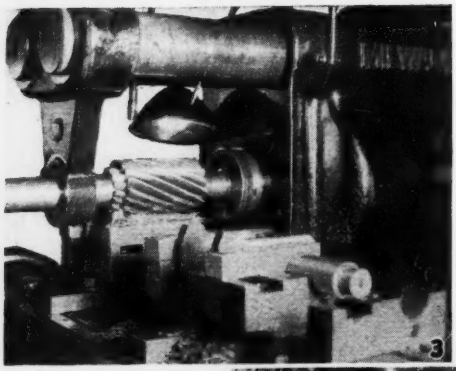


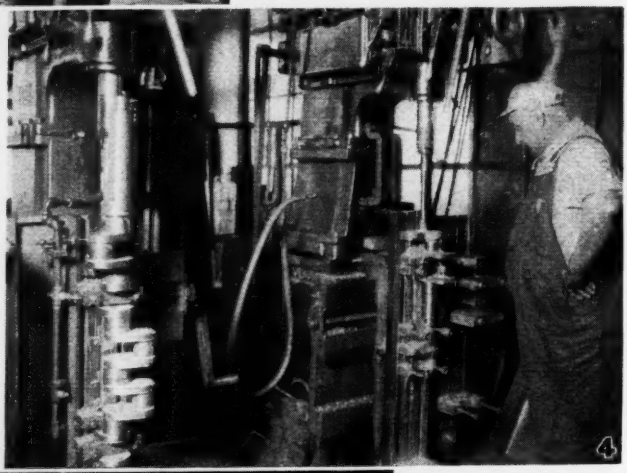
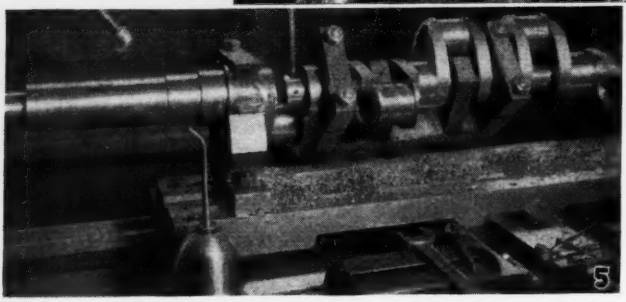


Fig. 3 — Milling the sides of LeBlond airplane motor shafts. Fig. 4—Drilling holes longitudinally through the connecting rod bearings. Fig. 5—A hole is machined through the main bearings of the Curtis shaft to lighten it and to provide a passing of oil.

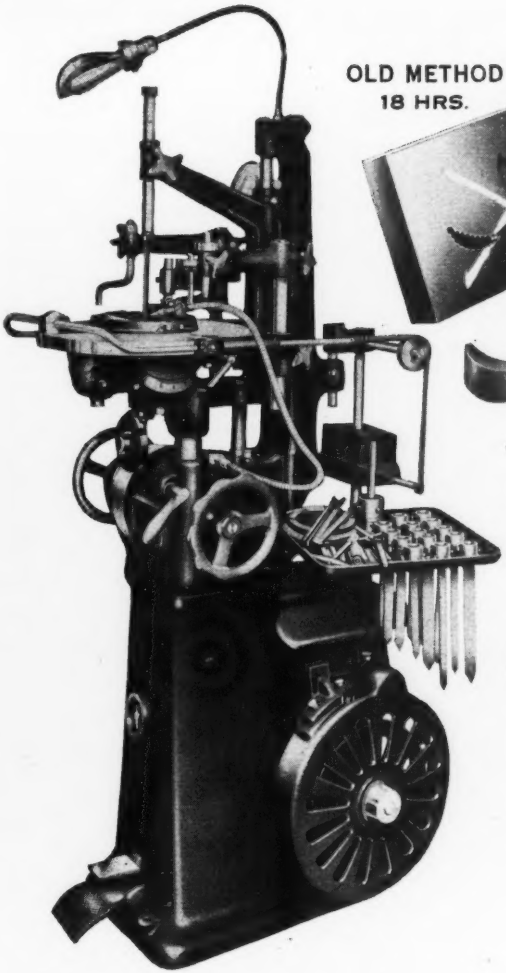
maining stock being removed in the finish-grinding operation.

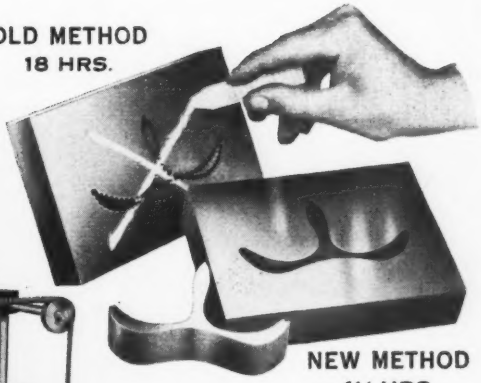
Figure 2 shows two Challenger crankshafts set up on a Cincinnati milling machine to have the sides of the web machined to size and shape. The shafts are located and held by the end bearings and crankpins, and special form cutters which mill three surfaces at a cut are used to remove the stock. The shafts are finished on these surfaces in order that they may be held to definite weights. The tolerance on this operation is .005 inch.

LeBlond aircraft motor shafts are finished on the sides by the use of the Milwaukee miller shown in operation in Fig. 3. This shaft is held in a special fixture which provides its own clamping device, and the milling is done by a pair of spiral cutters. As the sides of this shaft serve as bases for attaching counterweights, the allowance on this operation is limited to .0015 inch.



In Fig. 4 is shown a battery of two heavy duty vertical drilling machines, together with the jigs and equipment for drilling the holes that extend longitudinally through the shafts. The machine at the left is being used to drill 1¾-in. "lightening" holes though the pins of a Curtis airplane motor shaft, and the other ma-





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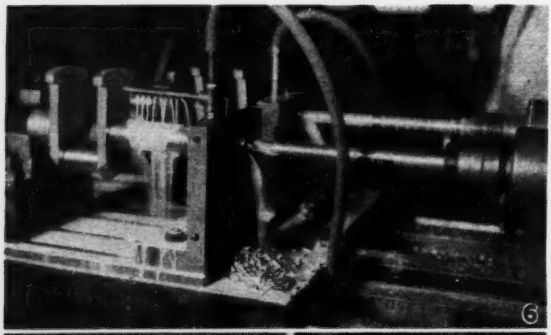

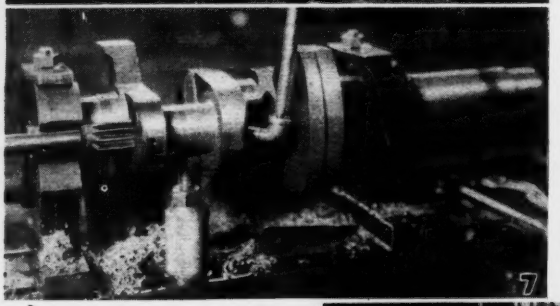

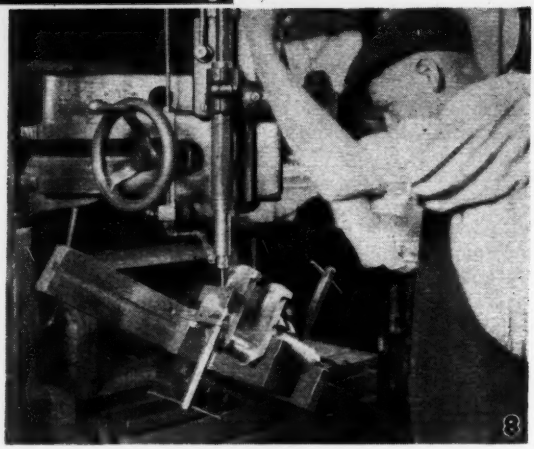

Fig. 6—A duplex "gun" drill is used to drill holes through the main bearings of the LeBlond shafts. Fig. 7—Connecting rod bearings on the Curtis-Wright "Challenger" shaft are bored out and plugged to provide oil reservoirs. Fig. 8—Drilling oil holes at an angle in a LeBlond crankshaft.

chine is shown in process of drilling 1⅛-in. oil-holes through the pin of a LeBlond motor shaft. Both shafts are held in jigs attached to vertical faceplates on the machines.

The pins having been drilled, the Curtis shaft is clamped in a jig on the ways of a lathe, as shown in Fig. 5, and a hole is machined longitudinally through the main bearings, both to lighten the shaft and to provide a passage for oil to these bearings. After rough drilling, the hole is bored with the boring bar shown in place in the illustration, then it is rough reamed and, finally, finish reamed. The users of these shafts demand that the hole through the bearings be so smooth that no tool-marks can be seen. Perfect alignment is maintained by the use of brackets in which bearings for the boring bar are located. The diameter of this hole is held to a limit of .002 inch.

Holes are drilled longitudinally through the main bearings of the LeBlond shafts with the Pratt & Whitney duplex gun drill shown in Fig. 6. Two shafts are drilled at a time in this machine, each shaft being clamped at the rear end, with the front end projecting through an angle plate which provides location. A $\frac{13}{32}$-in. drill 11 in. long is used, this length being necessary for the drill to pass through the entire length of the long front bearing.

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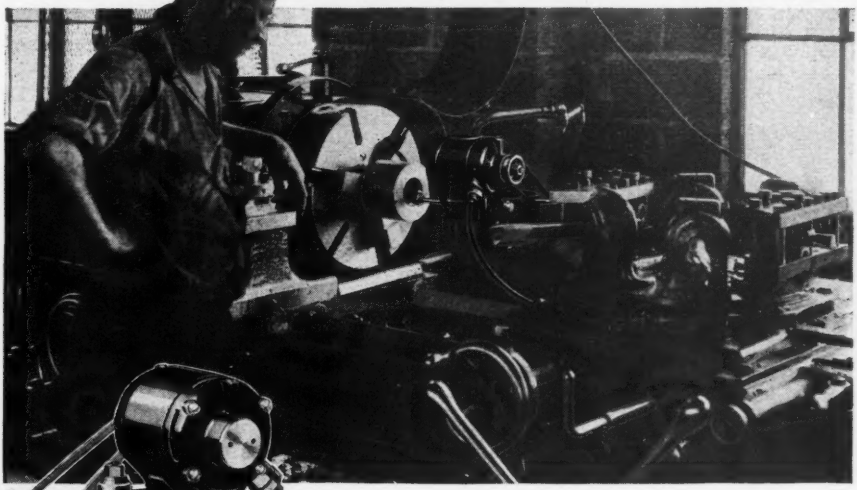

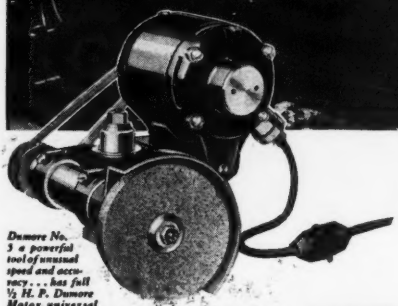

Dumore No. 5 a powerful tool of unusual speed and accuracy . . . has full ½ H. P. Dumore Motor, universal type . . . automatic oiling system . . . fan keeps the motor cool at all speeds . . . aluminum housing for light weight . . . variable speed . . . four quills . . . four pulleys . . . automatic belt tension . . . precision to .0001" . . . spindle speeds of 3,600 to 35,000 R.P.M.

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DUMORE HIGH-SPEED GRINDERS
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Each of the two connecting rod bearings on the Curtis-Wright "Challenger" crankshaft is bored out and reamed to a diameter of 1¼-in., then it is plugged again at each end to serve as a reservoir for oil. To perform this operation, the shaft is clamped to the table of a special boring machine as shown in Fig. 7. The reamer is also shown in this illustration. In order to provide certain and equal balance, the diameter of this hole is held to a limit of .0005 in. and the reamed surface must be entirely free from tool marks.

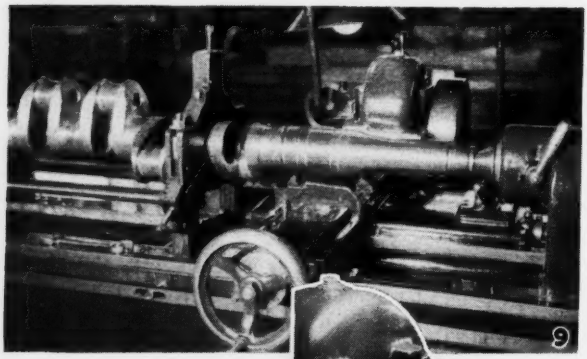
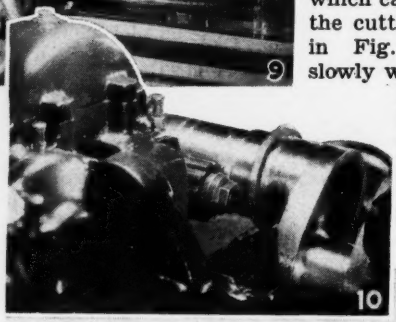
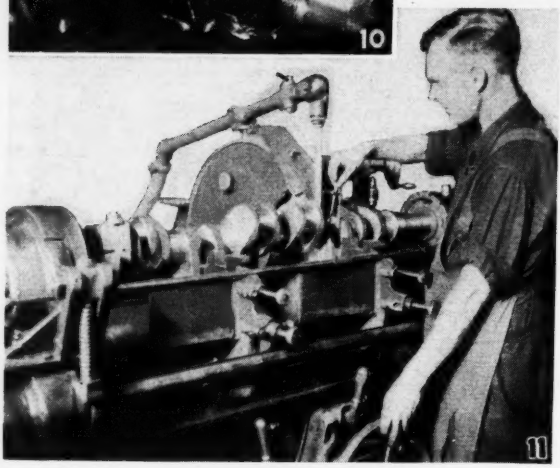


Fig. 9—Milling threads on a Curtis shaft. Fig. 10—Rear view of thread milling machine, showing cutter. Fig. 11—Grinding the pins on a Curtis crankshaft.



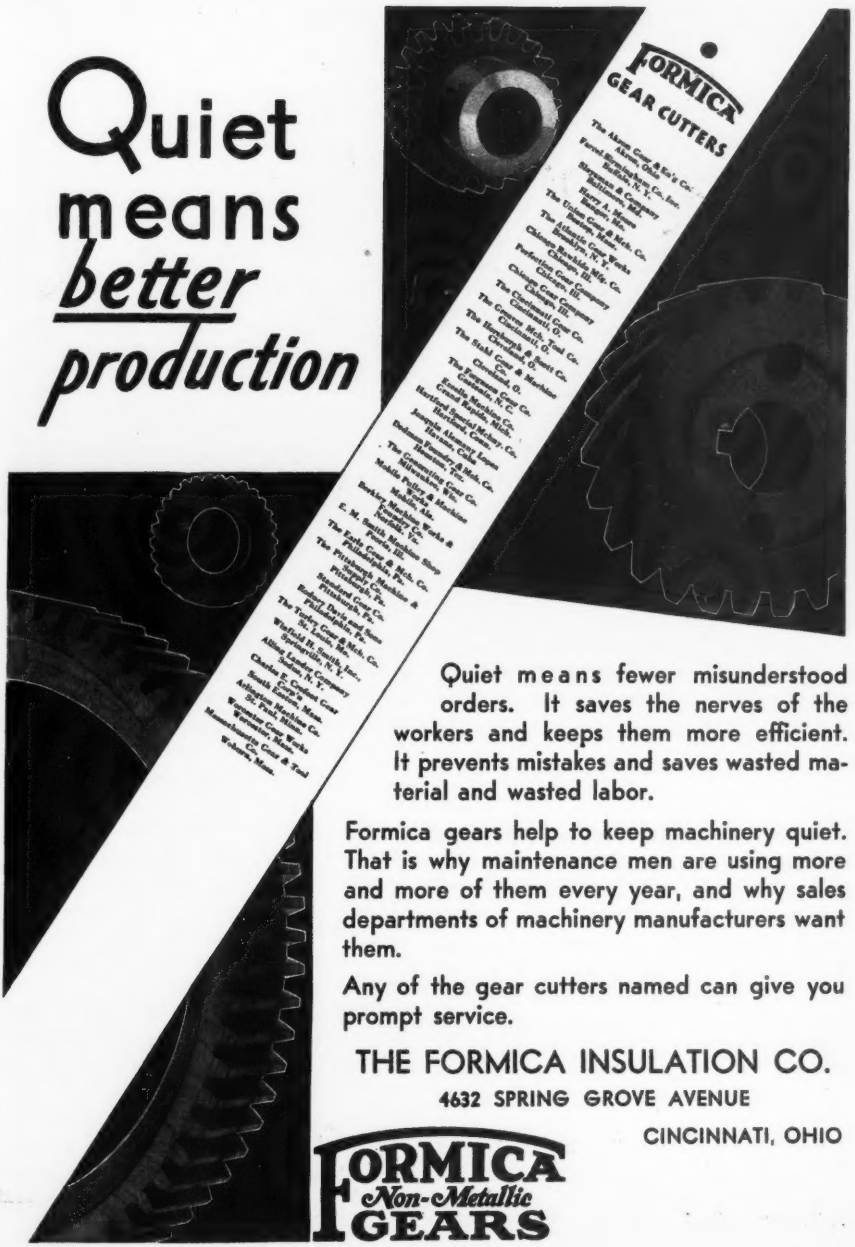
The operator shown in Fig. 8 is drilling $\frac{5}{16}$-in. oil holes at an angle in a LeBlond crankshaft, using a radial drill and a fixture which can be adjusted to any angle, length, or diameter of shaft. The bushing plate through which the drill is passing can also be changed to permit the use of bushing plates to fit special requirements.

Any threads required to be cut on the crankshafts are milled in with the Pratt & Whitney thread miller shown in operation in Fig. 9. The shaft shown in the machine is a Curtis airplane motor shaft, the front end of which carries a 3⅛-16 P. thread and a $2\frac{5}{8}$-12 P. thread. The shaft, which can be seen with the cutter in operation in Fig. 10, revolves slowly while the cutter revolves at a high rate of speed. The complete thread is milled in one revolution of the shaft, which takes about seven minutes.



The final machining operation on a crankshaft is that of grinding the crankpins and bearings. In Fig. 11 is shown the operation of grinding

Quiet means *better* production



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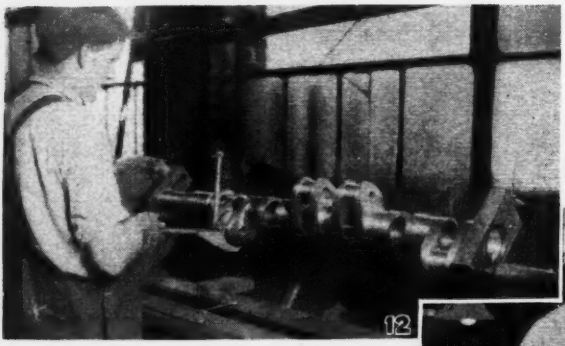

Fig. 12—All pins and bearings are lapped with a cast iron lap in which carborundum and oil are used. Fig. 13—Each shaft is thoroughly inspected before shipping.

the pins on a Curtis shaft to the proper diameters and lengths. The diameter is held to 2.375 in., plus .000 or minus .0005 in., and the lengths of the pins are held to within a tolerance of .002 inch.

After grinding, a high finish is put on the pins and bearings by lapping. The shaft is swung between the centers of a speed lathe and a cast iron lap, held in the hand, is used as shown in Fig. 12. The lap is dosed with a mixture of carborundum and oil before it is screwed down tight, and when the lap is removed, after being run at a high rate of speed for a fraction of a minute, the surface of the bearing is as smooth as glass.

After the final manufacturing operation is completed, each shaft passes to the inspection bench shown in Fig. 13, where it is carefully checked to make sure that all dimensions are within blue-print specifications.

Removing Oil Stains From Machine Tool Surfaces

By CHAS. R. WHITEHOUSE

OIL is sometimes allowed to drip or run over the surface of a machine until the finish has been stained to such an extent that it is practically impossible to remove such stains. They can be removed, however, by the use of a solution made and used as follows:

Combine equal parts of Benzol (not benzine) and pure paraffine wax by shaving the wax fine and dissolving it in the Benzol, making a fairly thick mixture. Using a brush, apply the mixture to the stained parts, or, if the parts are small enough, lay them in the mixture to soak. Allow the solution to stay on about an hour and then wipe the parts clean with a rag. It will not be necessary to scrub, as the stains will quickly disappear. The parts should then be cleaned in gasoline, as the oil remover will allow the parts to rust if it is not entirely removed. After wiping the gasoline off, the finish will be as good as new. The writer has used this method for years and has never yet found an oil stain that could not be removed.

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Legal Rights of Seller and Purchaser

By LEO T. PARKER
Attorney at Law, Cincinnati, Ohio

OCCASIONALLY the owner of a machine shop has found himself in a dilemma upon discovering that purchased supplies or newly installed equipment failed to render the anticipated satisfactory service. However, with knowledge of the established law on this subject, it should not be difficult for the buyer to discover just what he is legally entitled to, and to what extent the manufacturer of the equipment is responsible.

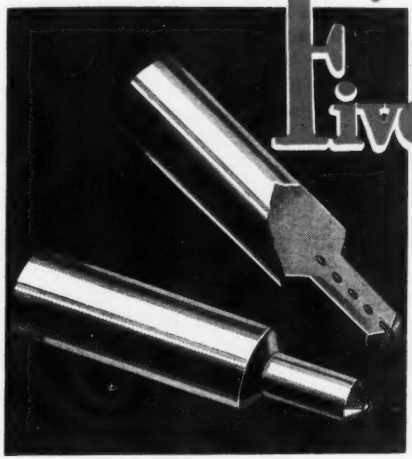
Therefore, it is the purpose of this article to explain the established law on this subject, and incidentally review several recent leading cases, so that both the machine shop owner and the manufacturer may readily determine their legal rights in controversies involving purchased machines, equipment or materials, which fail to meet the expectations of the purchaser.

Since a great majority of the sales of equipment and supplies to machine shop owners are made by salesmen, or representatives of a manufacturer, it is important to know that a salesman's sole implied legal authority ends with the acceptance of the order and the transmission of it to his employer for approval. If the latter is not satisfied with the offer submitted, he may reject the proposal or simply refuse to deliver the goods without sending the buyer notification. Conversely, the buyer always is privileged to send his cancellation of an order at any time before the salesman's employer acknowledges the same, irrespective of contrary clauses in the contract of sale.

In other words, the law is established that a salesman is merely a special agent, whose implied authority extends no further than the solicitation of a buyer's orders or proposals to purchase merchandise. Many higher courts have rendered decisions supporting this assertion. Therefore, if the seller desires, he may without liability reject the orders sent in by the salesmen, providing the rejection is made promptly upon receipt of the order. Moreover, this is true although both the buyer and the salesman signed the order intending to complete a valid contract of sale. For the reason that a salesman is merely a special agent, having limited authority, the manufacturer or seller never is liable for guarantees made by a salesman. Yet, if such warranties are specified in the contract, both the buyer and seller are bound.

For instance, in a recent case, Continental Co. V Smith, 7 S. W. (2d) 1060, a purchaser refused to pay for a shipment on the ground that the salesman misrepresented the quality of the merchandise. However, since the testimony proved that the quality of the goods was clearly specified in the contract of sale, the court held the buyer liable, saying:

"Solemn written contracts cannot be evaded or set aside at the will of one of the parties without the consent of the other. The time for



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a dealer (buyer) to consider consequences of this act is before he attaches his signature to a written contract, and not thereafter . . . but he should have thought of how it would look when he considered it uninfluenced by the persuasive talk of the agent."

In practically all litigations involving the sale of machines, supplies, or equipment to machine shop owners, the question is invariably presented to the court whether or not the manufacturer guaranteed his product. Generally speaking, guarantees are classified as **expressed** guarantees and **implied** guarantees. Where the buyer and seller have orally or in writing agreed to the terms of the warranty, such constitutes an expressed guarantee. However, an implied guarantee exists where the seller does not make a warranty, but the circumstances are such that the court will **imply** a warranty, irrespective of the contrary contentions or denials of the seller.

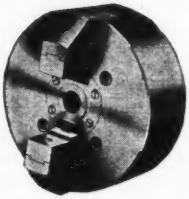
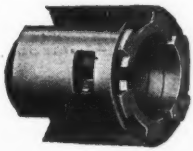
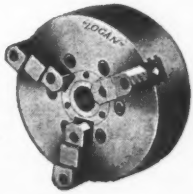
In other words, it frequently happens that the circumstances and intended uses of purchased equipment are such that a purchaser is compelled to rely upon the honesty of the seller to supply material reasonably fit for the intended purposes, although the seller does not specifically guarantee his product. In all such controversies the purchaser may win the suit if he proves to the satisfaction of the court that the equipment purchased failed to render such efficient service as may have been expected by other prudent and reasonable machine shop owners.

The usual and well established laws relating to ordinary contracts are applicable to controversies involving an expressed guarantee, whereas, since an implied warranty never is agreed upon by the parties to a contract, it is not a contractual obligation, but a common law right invokable by the buyer under the well established legal rule that "right is might." Obviously, a seller who fails to supply purchased equipment reasonably satisfactory is liable in damages to the purchaser under the implied guarantee rule of the law.

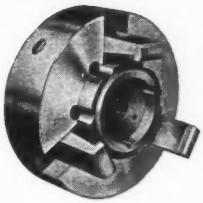
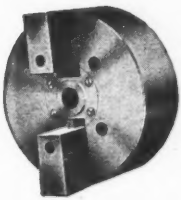
It is important to know that although certain purchased machinery or equipment is adapted for general uses, the manufacturer may be liable for an implied guarantee that it will perform a **special** purpose, particularly if he knows that the purchaser intended to use it for this special purpose.

For instance, in a certain case it was disclosed that a manufacturer accepted an order for grinding machinery adapted for general grinding purposes. Although the seller was informed that the purchaser intended to use the equipment for a special grinding operation, he did not expressly guarantee that it would satisfactorily perform the special operation. The buyer refused to pay for the machine when he discovered that it was unfit for his work. He contended that the implied warranty rule was applicable. The manufacturer argued that he was not liable for a guarantee because the machine would satisfactorily perform its usual functions. However, the court held the seller liable for an implied guarantee, relieving the buyer from paying for the machine, and stated the following important law:

"Where the buyer purchases the goods for a particular purpose, a warranty is sometimes implied that the goods shall be fit for that purpose. If the seller contracts to fur-

CHUCKS THAT SAVE TIME—EFFORT—MOTION

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nish goods for a specified object, it is often proper on a construction of the contract itself to hold that he has agreed to furnish something that will accomplish the object desired. . . . When one contracts to supply an article in which he deals, to be applied to a particular purpose, so that the buyer necessarily trusts to the judgment or skill of the vendor, there is an implied warranty that it shall be reasonably fit for the purpose to which it is to be applied; and the better doctrine is that this rule applies to dealers as well as to manufacturers, and not to manufacturers alone."

In another case a machine shop owner purchased paint for a special purpose and informed the salesman of the intended use. When the paint failed to give satisfaction the buyer filed suit to recover the purchase price, plus the damage caused by application of the paint. The court promptly held the seller liable.

On the other hand, it is important to know that a buyer cannot expect a seller to determine by deduction the uses to which he intends to put a purchased machine. In other words, a seller or manufacturer is not legally liable for the unfitness of a thing he sells where he or his authorized employee is not clearly informed of the intended uses of the buyer. However, if the seller is fully informed of the situation and he fails to supply a product adapted to perform the intended purposes, the purchaser may spend money to repair or alter it and the manufacturer is liable for the amount thus expended. Moreover, if the machine or equipment is better adapted to render satisfaction after it is repaired by the buyer, yet still it does not render reasonably satisfactory services, the purchaser is entitled to damages in addition to the money he expended for repairs.

For example, in a case that has been decided during the past few weeks, it was disclosed that a new machine failed to operate properly. The buyer proceeded, **without knowledge of the seller,** to expend $75 in repairing it. After expending this amount the machine was worth $450 less than its purchase price, because it did not operate properly. The seller sued to recover from the buyer the full amount of the contract price, contending that since he had not expressly guaranteed the machine, the user should have reshipped it.

However, the court held the purchaser entitled to the depreciated value of the machine plus the cost of the repairs, saying:

"If the machine was defective, and it appeared that these defects might be remedied at a reasonable cost, the purchaser had the right to affirm the sale and make the necessary adjustments and to recoup the cost thereof when sued for the balance of the purchase money . . . But if, notwithstanding the repair, the defect is not completely remedied . . . the purchaser may recoup the difference between the value of the article as repaired and its contract price, together with the cost of the repair."

The law is well established that an implied warranty is destroyed by any written or verbal agreement between the buyer and seller by which the seller clearly states that he does not impliedly guarantee the machine. For instance, in the leading case of International Co. V Bean, 169 S. W. 549, the contract distinctly specified an expressed guarantee and stated: "This express warranty excludes all

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implied warranties." The court held that the buyer was prevented from relying upon the law that the seller impliedly warranted the machine to render reasonable satisfaction.

In still another case, Dowagiac Mfg. Co. V Mahon, 101 N. W. 903, the language construed as excluding the implied warranty was: "It is understood the machine is warranted only against breakage caused by manifest defect in material." In this contract the word "only" restricted the meaning of the word "warranted." Also, in Somerville V Gullet Co., 194 S. W. 576, the contract stated that the article was sold "subject to the warranty expressed on the back hereof **and no other.**" On the back of the order was printed a detailed guarantee of the quality of the machine.

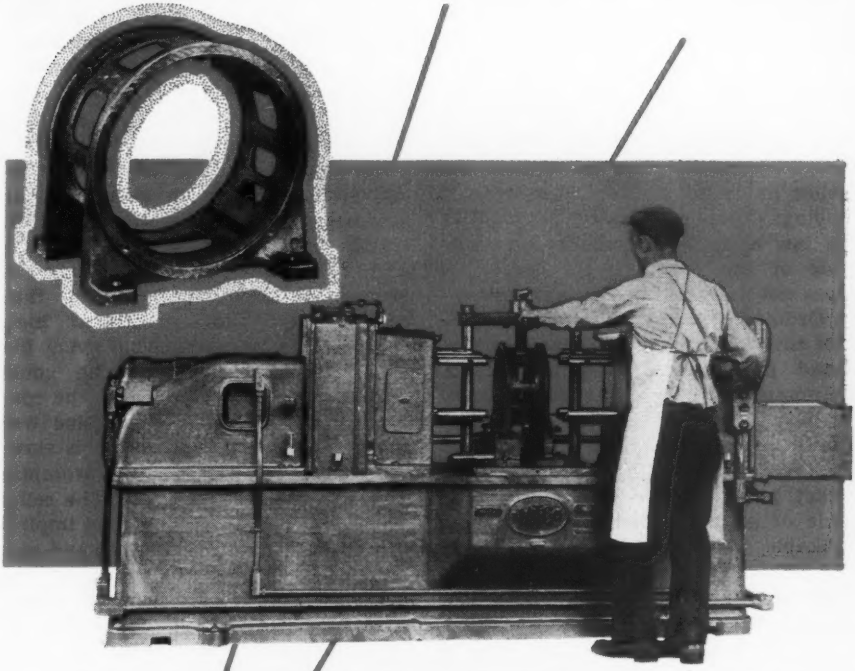
Frequently, sellers formulate contracts of sale, containing express warranties of little or no consequency, in view of destroying the usual implied warranty. However, an ordinary written guarantee does not tend to depreciate the effectiveness of the implied warranty, unless the expressed warranty specifically indicates it was intended by both the buyer and seller that there be no implied guarantee.

For example, in one case it was disclosed that a buyer ordered a machine. The contract of sale provided that the seller could within 30 days return it, if he was not satisfied. The contract also contained a clause by which the seller agreed to supply any defective mechanical parts for a period of five years from the date of delivery.

The purchaser failed to return the machine within 30 days. About four months later he discovered that it was inaccurate. He notified the seller, who refused to repair the machine, or take it back. The buyer refused to pay the account and the seller filed suit, contending that since the former had failed to return the machine within 30 days there could be no implied warranty, irrespective of the poor quality of the equipment. It is interesting to observe that the lower court held the purchaser bound to pay for the machine, but the higher court reversed this verdict, saying: "After the expiration of the 30 days, the defendant (buyer), of course, lost his option to return the machine. That is a part of the contract, and he is bound by it. This, however, does not exclude the implied warranty of fitness to perform the ordinary work for which it was made."

The fact that a contract of sale contains a simple guarantee against defective workmanship and materials does not preclude a machine shop owner from invoking the implied guarantee rule, should the machine fail to give reasonable satisfaction.

This point of the law is well illustrated by a case in which the court held the seller liable on an implied guarantee, notwithstanding the fact that the contract contained a clause guaranteeing the machine against defective workmanship. This court said: "It is first contended that the written warranty against defective workmanship and material excludes the implied warranty of fitness. In the absence of contract which negatives the same, there is an implied warranty in the sale of machinery that it is suitable to perform the ordinary work for which it was made." Moreover, the fact that the contract contains vague statements does not destroy the implied guarantee rule. For illustration, in another case the contract of sale contained certain express war-



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Above is shown a 2-Way NATCO Lead Screw Tapper arranged for tapping 8 holes in any one of four different sized motor frames. Sizes of holes ranging from $\frac{3}{8}$" to $\frac{1}{2}$", depending upon the size of the particular frame being tapped.

Machine is built of two fixed center gear driven heads, each head containing 12 spindles arranged with individual lead screws to each individual tap.

Both heads are driven by one 5 h. p. reversing motor drive unit which is semi-automatic in operation and which is provided with a push button control.

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"NATCO Solves Your 'Hole' Problem"

THE NATIONAL AUTOMATIC TOOL CO.

RICHMOND, INDIANA, U. S. A.

ranties, and also included the statement "that the instrument comprises the entire contract between the parties . . . and any verbal . . . agreements outside of, or contradictory to, the foregoing terms and warranty are . . . void." The court held the seller liable for an implied warranty, saying: "Inasmuch as the warranties by law arise, **independently** and outside of the contract, this provision does not exclude implied warranties."

Ordinarily, an implied warranty is not invokable with respect to second-hand machinery or equipment. A purchaser of a used machine refused to pay for it because he discovered that it was worn out and useless. The seller sued to recover the contract price on the ground that the rule of implied guarantees is not invokable in contracts involving used merchandise. The court promptly held the purchaser bound to pay the full purchase price, saying: "There was **no implied warranty** of the serviceability of the machine, and an express warranty could have been shown in this case only by proving statements of the seller in the transaction between himself and appellant (buyer)."

Obviously, however, a seller of a second-hand machine impliedly warrants that it will perform any special service for which he knows the buyer expects to use it. For illustration, in a recent case (119 So. 781) a machine shop owner purchased a second - hand lathe, explaining that he desired it to operate at high speed. The salesman, however, did not expressly state that he could supply a high-speed lathe at the contract price. When the machine was delivered it was found to be a slow-speed lathe and the buyer promptly refused to pay the notes. The seller filed suit, contending that no implied guarantee exists on second-hand machinery, but since, in this case, the purchaser had informed the salesman of the kind of a machine desired, the court held the seller bound by an implied guarantee that the lathe would operate at high speed.

Number of Teeth In Metal Saws

THE number of teeth in metal saws for different kinds of work is a matter upon which saw users do not entirely agree, due to the many conditions governing each particular case. From the standpoint of maximum efficiency, the size of the stock and the rate of feed to be maintained practically control the tooth spacing and also, to an extent, the thickness of the saw. The larger the cut to be made, the greater the amount of chips each tooth has to carry through the cut and there must be gullet room enough to carry free and not wedge in the gullet, or the result will be a broken tooth and quite possibly a broken saw, as the tooth is likely to stick in the cut.

The heavier the feed, the more chips each tooth has to care for, consequently the tooth-spacing must be coarser in order to provide clearance. Soft stock of .45 carbon or less requires the use of coarser teeth than would be necessary on higher carbon and high speed steels, for the reason that the former can be cut more rapidly than the latter and more space is required between the saw-teeth for chips. The thickness of the saw-plate should be the same, where each kind of material is cut at a maximum rate.

A coarse-tooth saw should be used wherever possible, as less friction is generated and the saw is left much cooler. It will not only do more work between sharpenings, but less power is required to drive the saw.

From "Methods of Cutting Metal," Pub. by Simonds Saw & Steel Co.

THOSE WHO TEST THEIR PRODUCTS ARE NOT AFRAID OF THE TRUTH
WILSON-MAEULEN CO
381 CONCORD AVE NEW YORK
ROCKWELL HARDNESS TESTER

Fixtures For "Offset" Milling

By HOWARD CAMPBELL

IN this article opportunity is taken to augment the information given in articles V and VI of the series "Modern Tooling Practice," by including descriptions of several fixtures designed for use in "offset" milling. In offset milling, the workpieces are clamped in fixtures arranged in a circle on a circular table which revolves about a cutter held on a vertical arbor. The center of the cutter is offset from the center of the table so that the cutter-teeth, at the point of greatest depth, will cover the surface to be finished. The principle is illustrated in Fig. 1.

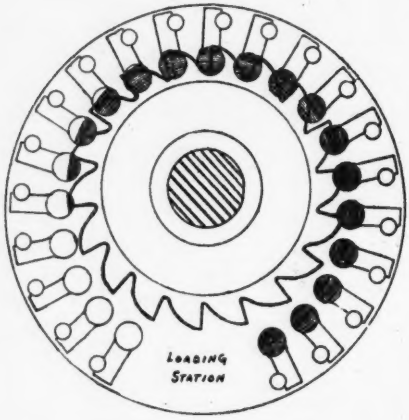

Fig. 1—Illustration of principle of "offset" milling.

The fixture shown in Fig. 2 serves very well to illustrate the general design of fixtures for use in offset milling. The picture was taken looking directly down on the cutter and fixture and shows the relative positions of the cutter and work. The fixture is made to hold eight pieces, each of which is held in place by a clamp that is controlled by a star-wheel. The star-wheel, in turn, is automatically revolved by vertical pins located in stationary housings. There are two sets of four pins each, one set being located at the left side of the operator's position to clamp the work and the other set at the right side to unclamp the work as it comes around after being machined. Each pin is tapered at the end and is mounted on a spring so that it can slip off the star-wheel if the pressure against it is too great. The clamping pins are mounted with the tapered ends up, and the pins for unclamping are mounted in an overhead housing with

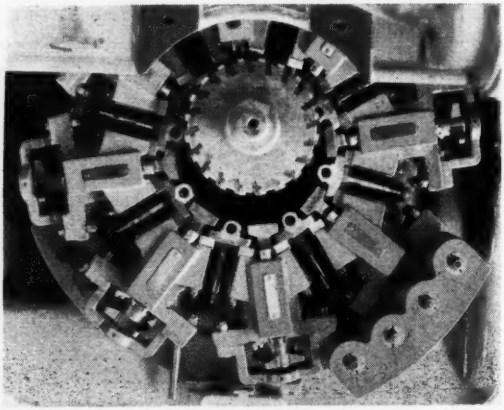

Fig. 2—Fixture for offset milling steering knuckles.

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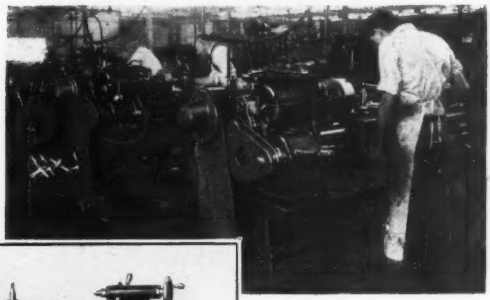

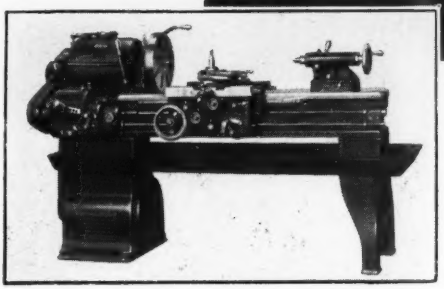

Serve Many Industries

Rockford Economy Lathes are used in many shops—on tool work exclusively here, on high production work there. Sometimes these lathes serve many industries in a single shop. For example—in the tool room of the Wiley Machine Company's plant at Los Angeles, California (shown above) these lathes are used in precision and production work on a great variety of tools and special machinery for the airplane and motor, motion picture, radio, oil refrigeration and other industries. No better test of lathe value can be imagined—and no better demonstration of Rockford Economy Lathes devised—than their successful operation in this shop. Hy-Service Shapers also serve many industries and Hy-Draulic Shaper-Planers are leaders in handling a particularly bothersome class of shop work. Details of design, specifications, installations or prices of these machines supplied promptly on request.

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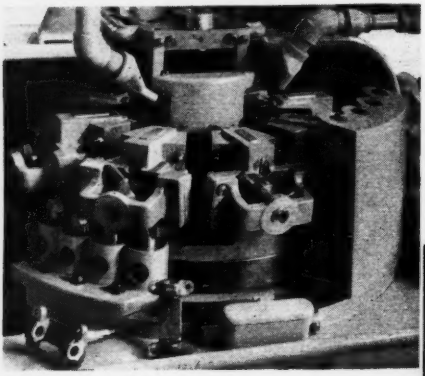
the tapered ends pointing downward. As the table revolves, each pin catches a point of the star-wheel and gives the wheel a quarter turn, clamping and unclamping the work mechanically. A front view of the fixture, giving a better view of the pins, is shown in Fig. 3. This fixture is made to hold steering knuckles.



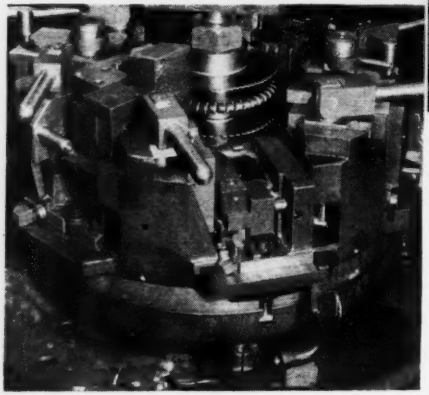
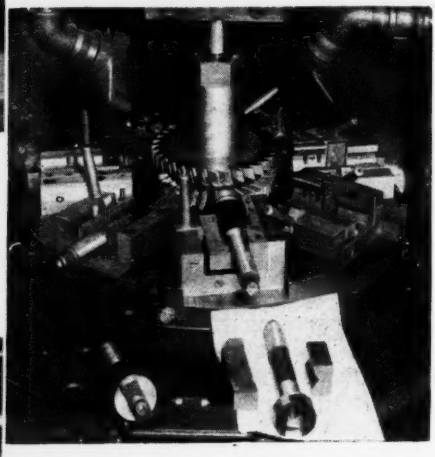


Fig. 3 (Above)—The work is automatically clamped and unclamped by vertical spring-pins which revolve the star-wheels. Fig. 4 (Right)—Simple clamping fixture with interchangeable jaws for holding a variety of parts. Fig. 5 (Below)—Fixture for holding transmission parts. The pieces are clamped by a cam-action hand lever.

Figure 4 shows a simple fixture arranged with interchangeable jaws for holding different parts. As shown, the fixture is fitted with jaws for holding the male part of a coupling, one of which can be seen at the left in front of the fixture. The piece is locked in position by a cam-action lever which is operated by hand, the lever forcing the moveable jaw and work against the stationary jaw.

Another fixture made with interchangeable jaws so that it can be adapted to hold different parts is shown in Fig. 5. The jaws in use are holding transmission parts, the jaws being arranged at different elevations to present the workpieces to the cutters in the correct sequence. With the first set of jaws, the pieces are held so that the bearing surfaces in the shifter end can be machined. The jaws are then changed and the slots and grooves are milled in the opposite ends of the pieces. The jaws in both cases are locked against the work by the action of cam-levers, operated by hand. Forcing the cam-lever to a horizontal position draws upward a pin with a tapered bearing which



(Continued on page 100)

The DRAWING TABLE WITHOUT A COME-BACK

The Hamilton Steel-Base Table

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Base of steel, not cast iron. Strong, rigid, unbreakable.

ADJUSTABLE

Adjustable in height or slant. Has the new spiral-shaft-lever movement. Adaptable to vertical drafting.

COMFORTABLE

Note the large foot-board.

SAFE

Top cannot drop down accidentally. The hand wheel on side must be turned.

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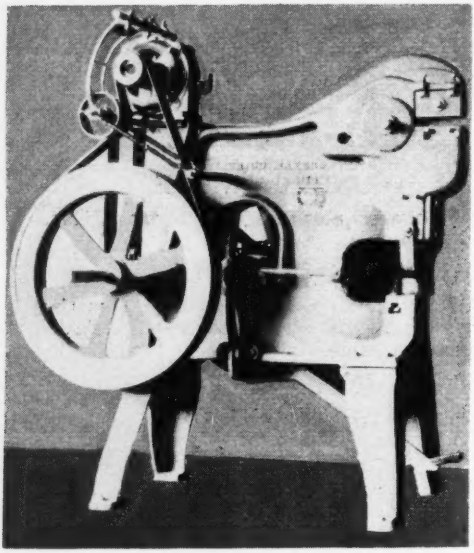
Advantages of a Spring-Loaded Wrapper Pulley

By W. F. SCHAPHORST

I WISH to point out the advantages of a well-designed, spring-loaded wrapper pulley over a weighted wrapper pulley. A spring-loaded wrapper pulley of excellent design is shown in the illustration, adapted to a metal shear.

The principal objection to a weight-loaded wrapper pulley in a drive of this kind is the inertia of the weight. Owing to the fact that the load of a metal shear fluctuates greatly, the wrapper is also liable to fluctuate. The seriousness of the fluctuations of the wrapper pulley depends, of course, upon the fluctuations of the flywheel. To eliminate all fluctuations in a metal shear would in many cases require an enormous flywheel—a wheel weighing, possibly, more than everything else combined. There is a limit beyond which designers of machines refuse to go, and they cannot be blamed.

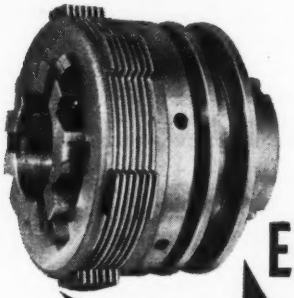


Metal shear equipped with spring-loaded wrapper pulley.

For these reasons, the wrapper pulley on such a drive as this usually fluctuates considerably and—as already stated—if the wrapper pulley is loaded by means of a weight, the inertia of the weight sometimes causes trouble. As is well known, a body in motion tends to continue in motion and a body at rest tends to continue at rest. Therefore when a weighted wrapper pulley is thrown away from the belt, it tends to keep on going in the direction thrown, and often does keep on going to the extent that the wrapper pulley does not make contact with the slack side at all and belt slippage occurs. Every time the wrapper pulley is out of contact, there is a momentary slip.

By making the wrapper pulley and all parts connected with it as light as possible, as shown in this photograph, and by using springs instead of a weight to pull the wrapper pulley against the belt to increase the arc of contact with the small pulley, the effects of inertia are largely eliminated. A pulley of this type will act much more quickly and will continually maintain its contact with the slack side.

The tendency is, also, for a weighted wrapper pulley to hammer the belt on



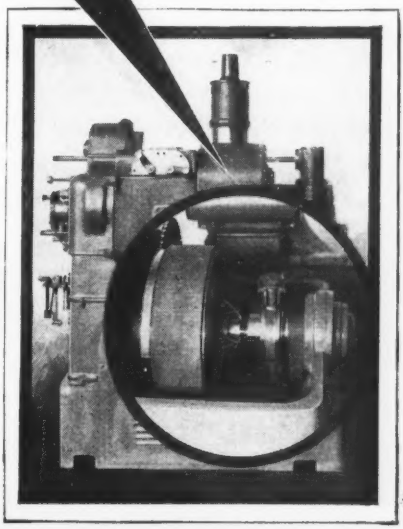
Single Close Coupled Type Twin Disc Clutch designed to run in a spray of oil. Compressed asbestos gear tooth driving plates used in place of bronze driving plates when clutch is run dry.

Especially adapted for HEAVY-DUTY PRODUCTION

PRODUCTION WORK on such heavy-duty service as cutting tractor and other coarse-pitch gears, demands a gear shaper simple and compact in design, yet massively constructed. The Fellows Gear Shaper Co., Springfield, Vermont, completely fulfills this demand. Their 6A-Type Gear Shaper cuts both external and internal spur and helical gears up to 18 in. pitch diameter.

Especially adaptable to motor drive . . . the machine's main drive is through a single pulley, Twin Disc Clutch, and change gear box. The starting lever engages the Twin Disc Clutch through a link connection. At the completion of the gear the machine stops automatically, the clutch being disengaged by a tripping mechanism. The simple, rigid construction of this mechanism affords great convenience in setting up the machine, as the cutter can be stopped at any desired point by simply "slipping" the clutch and then stopped in that position by a brake.

The designers of this machine appreciated the remarkable adaptability and unequalled compactness of the Twin Disc Clutch fully as much as its greater capacity and dependability. Our Engineering Research Dept. understands the designer's problems. Write for specific recommendations or Engineering Data Book. ***Twin Disc Clutch Company, Racine, Wisconsin.***



TWIN DISC CLUTCHES

a drive like this, whereas a spring-loaded wrapper pulley delivers a steady pressure that is free from severe shocks. It is obvious that if a wrapper pulley and its parts could be made entirely weightless, there would then be no inertia and the pressure of the pulley against the slack side of the belt would be constant. Such a condition would be ideal.

It is not at all uncommon for weighted wrapper pulley drives to give trouble, due to the effects of inertia. The usual method of eliminating such trouble is to increase the weight. The relief obtained by increasing the weight is, however, short-lived. Increasing the weight usually increases the stress to such a point that the belt will break long before it should. With increase in weight, the hammering action usually increases in proportion and the best of belts will sooner or later succumb to such abuse. I have seen some good belts ruined in this manner, and the worst of it was that the belt was blamed for the trouble instead of the weighted wrapper pulley.

The next time you have difficulties of this kind, apply a light wrapper pulley, load it with a spring, and notice the improvement.

Lighting the Machine Shop

(*Continued from page* 18)

reach without accident risk, some form of disconnecting hanger is recommended. A considerable portion of the light from a fixture strikes the walls of the room, the surface reflecting back a part of the light striking it and absorbing the rest. White walls reflect approximately 80 per cent of the incident light striking them; dark brown walls, on the other hand, reflect only 15 per cent of the light reaching them. Thus when the walls and ceiling are refinished in light color, the level of illumination in the rooms may be increased from 50 per cent to 100 per cent.

Don't let dirt and grease short change you—count your footcandles and be sure you are getting value received for your investment. If every time you bought ten gallons of gas for your automobile the attendant spilled two gallons and insisted you pay for the lost mileage, you would be more than passively concerned, so when you buy a lighting system capable of delivering ten foot-candles, be sure that all of these foot-candles are delivered where you want them. Be sure your voltage is right. As a general rule in buying lamps you need not worry about voltage, because the voltage for any locality is fixed and the lamps sold in the locality are correct for that voltage. On the other hand, when it comes to wiring your building, the matter of voltage loss is of primary importance. It is good practice to install large enough wiring so that the voltage drop from the switchboard to the sockets is not over 2 per cent.

Good Tools

A TOOL can never be better than the steel of which it is made. Many times this point is confused by individuals who have something to gain or by men who wish to demonstrate their own particular tool-making skill. A skilled workman can sometimes make a better tool out of an inferior steel than an inferior workman can make out of good steel. The point cannot be disputed, however, that the tool can be no better than the steel used in it. Back of this, the steel can be no better than its process of manufacture.

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The smallest wheel of the finest Swiss watch is finished with no greater care and precision than is each part of a Wetmore Adjustable Reamer.

Is it any wonder, then, that those who can recognize supreme quality in a reamer are satisfied with none but a Wetmore? . . . . . Write for latest catalog of all types of Wetmore Adjustable Machine and Cylinder Reamers and replacement blades.

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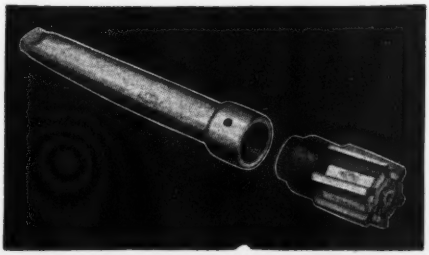

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TYPE NO. 2 ADJUSTABLE REAMER

Left-hand angle blades—high-speed steel, hardened and ground—insure free cutting at all times. Adjustments to .001 inch can be made rapidly and accurately. Micrometer adjusting screw is at front end of body. Adjustable in less time than ordinary reamers. Oversize adjustment insures long life for each set of blades. Solid alloy steel body is heat-treated. Sizes range from 1" to 3", inclusive. . .

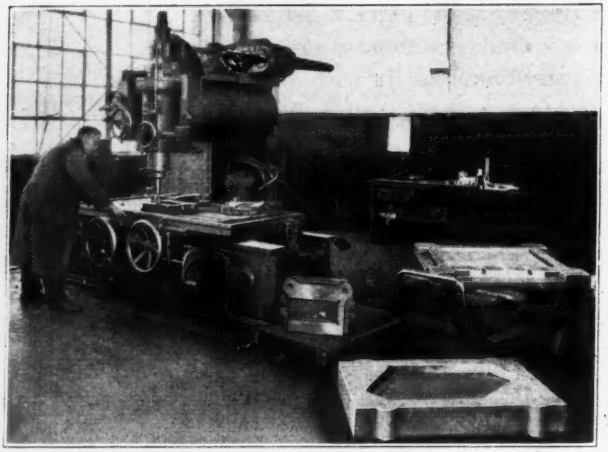
Ideas From Readers

This department is a clearing house for ideas. If there is a "kink" or short cut in use in your shop, send in a description of it. We will pay $5 for each one published.

Casting or Machining Wells In Die Sets

By PAUL A. BARD

WHEN a standardized die set is purchased, it reaches the toolroom completely assembled, ready for use. The die or tool maker then has merely to mount the die. Mounting the die, however, may necessitate a considerable amount of work drilling out inserts or wells, where these are necessary, to accommodate the die blocks. The rehandling and extra work may be quite difficult on the larger die sets, especially where the toolroom is ordinarily not properly equipped to handle heavy work for which crane equipment is required.



—Vertical miller in process of machining wells in large die sets.

Important savings in time, labor, and expense can be made when the walls or inserts are cast at the same time the punch holder or die holder is poured at the foundry. This, of course, is a simple matter which can be taken care of by adding a frame to the dimensions on the surface of the regular pattern. Where inserts or wells for die blocks are to be machined, if the machining operation is done at the time the working surfaces of the punch and die holder are machined, the rehandling and second set-up are eliminated. Moreover, this method assures perfect alignment, parallel surfaces, and so on. All that is required of the toolroom is dropping of the die into position, all heavy work having been done previously.

The accompanying illustration shows a vertical milling machine in use for countersinking wells and machining inserts at the Danly plant. Some of the jobs in which wells have already been milled out can be seen in the foreground. A recent trip through the Danly plant brought out the fact that users of large die sets quickly recognize the importance of being able to have the wells or inserts cast in or machined at the plant, under ideal conditions and on a production basis. It means that the die set is ready for the die as soon as it is received at the toolroom.

FOSDICK

21-inch Heavy Duty Upright Drill

for all standard drilling jobs

All-geared drive.

Ground column.

Column braced. Brace encloses drive shaft.

Spindle is high carbon hammered steel forging.

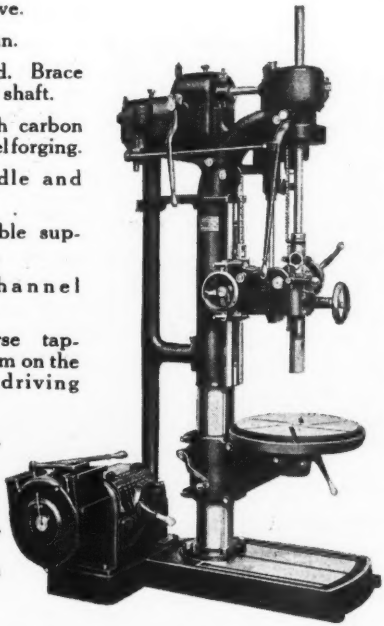
Ground spindle and sleeve.

Extra rigid table support.

Lubricant channel around table.

Friction reverse tapping mechanism on the high speed driving shaft.

Speed box convenient, containing steel gears giving 12 spindle speeds. Five feeds to each revolution of spindle.



Hardened steel bevel gearing to transmit power.

Ball bearing bevel gear thrusts.

Start, stop and reverse friction lever conveniently located.

Worm feed. Worm runs in oil bath.

Duplex feed and quick return.

Power feeds controlled by single lever—can be shifted while drilling

Automatic trip and depth gauge.

Capacity — 2½-inch H. S. drill in steel or 3-inch pipe tap in cast iron.

This machine has been especially designed to meet the demand for a high-grade, rigid, accurate, powerful drill for all kinds of standard drilling and tapping jobs. All-geared drive for drilling, and the most powerful friction reverse tapping mechanism known for tapping.

BUILT IN THREE SIZES—21", 25" and 30".

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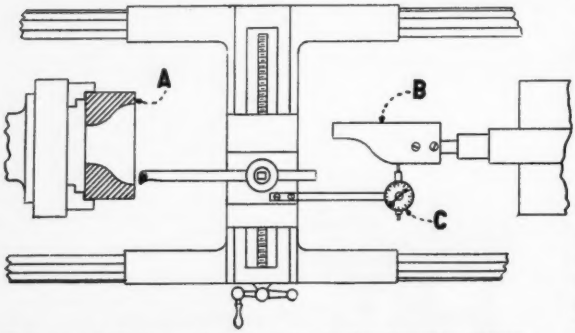
THE FOSDICK MACHINE TOOL CO.

CINCINNATI, OHIO, U. S. A.

Profile-Boring In the Lathe

By CHARLES KUGLER

HAVING a number of cast iron core-boxes to bore, we simplified the task, and saved time and labor by using the method described below.



Using an indicator and pattern for boring irregular shapes.

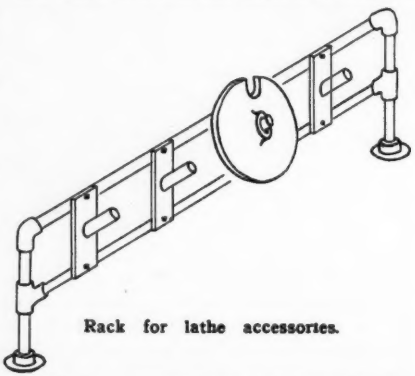
The contour of the bore, shown in the cross-section of the core-box **A**, was duplicated on a piece of sheet brass which was cut as outlined and attached to the tailstock center as shown at **B**. With the boring tool in position, a bar carrying a dial indicator was bolted to the cross-slide, as shown at **C**. After setting the tool to bore the correct diameter, the indicator was set to zero and the longitudinal feed was thrown in. The hand cross-feed was used to keep the indicator hand at zero, the tool duplicating the contour of the pattern in the bore of the core-box. While a little awkward at first, the operator was soon able to follow the pattern without difficulty. After making sure that the tool would not be obstructed, and that an excess amount of stock would not be encountered, the operator was able to give most of his attention to the dial indicator. I have used this method of machining profiles on external work as well as internal, with equally good results.

Rack for Lathe Accessories

By H. L. WHEELER

ALTHOUGH there is a growing tendency to keep machine shops cleaner and in better order than they were kept in grandfather's time, there are still many shops where lathe chucks, face plates, steadyrests, and all manner of tools will be found lying on the floor around the lathes. This "system" not only detracts from the general appearance of the shop, but it also makes it difficult to keep the floor clean around these machines. In addition, the tools become covered with dirt and shavings and depreciate much faster than they would depreciate in service.

The writer is acquainted with one shop where simple pipe racks, such as the one shown in the drawing, are provided for convenience in storing the lathe parts while not in use. The racks are placed just back of the operator's position or behind the machine, according to conditions. For light lathes, the rack is made of 1-in. pipe, with 1¼-in. to 1½-in. pipe for the



Rack for lathe accessories.

14 leaders cooperated *in preparing this book* for you

Presents facts and figures on fastening methods which have proved particularly advantageous.

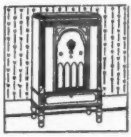
TO help you attain greater fastening economy this interesting and informative booklet has just been published. It was prepared with the cooperation of fourteen of the most prominent manufacturers in their respective fields, who permitted a nationally known firm of engineers to enter their plants and make studies of fastening methods which have proved particularly advantageous.

Certified facts and figures from those studies make up the booklet. Every production executive who is interested in attaining faster, easier, more economical assembly of a product made wholly or partly of metal should read with great interest such accounts as:

Servel saves $64,120 a year . . .

by assembling the exterior metal sheathing of their refrigerator cabinets with Hardened Self-tapping Sheet Metal Screws. This story of fastening economy is told by one of Servel's engineers, who describes the former methods of making the assembly, as well as the present method which eliminates a skeleton frame-work of wood with a saving of $1.00 per cabinet.

44 tapping operations eliminated on Philco Radio



by fastening parts to the chassis with Hardened Self-tapping Sheet Metal Screws. The details of this achievement are particularly interesting since few products require more assembly work than a radio receiver. This report also explains the severe tests by which Philco determines the security of a fastening.

50% saving made by Doehler . . .

through the use of Self-tapping Screws on both vending machine and metal furniture assemblies. In this fastening study, the Chief Engineer of Doehler Die Casting Co. discusses alternative methods of fastening to die castings and of assembling sheet metal.

Enormous savings effected in auto production . . .

where fastening devices are selected with utmost care. That such effort pays, is proved by an account of the way a great builder of auto bodies saved $150,000 in a year by using Self-tapping Sheet Metal Screws for making fastenings to sheet metal.

Every study is worth reading!

All of the fastening studies in this book are interesting. Other contributors include: Zenith-Detroit, Gilbert and Barker, Stout, Edison and Simmons.

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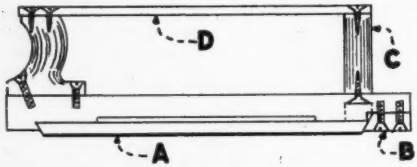
heavier machines. The studs on which the tools are hung are made of cold rolled steel and are held in position by bolts put in from rear. Flanges on the vertical end-pieces provide for anchoring the rack to the floor. Not only do these racks aid in making it possible to "keep everything off the floor," but it is also easier for the operator to lift a heavy chuck off the rack than off the floor.

File Mounting For Finishing Flat Surfaces

By F. W. WINIFRED

THE accompanying illustration shows a method of mounting a file to a handle which will aid greatly in the finishing of flat surfaces. The file to be used is cut to the required



Flat surfaces can be finished better and easier with this tool.

length and the ends are ground at an angle, as shown at **A** in the sketch. It is then placed in a corresponding recess in the body of the holder, where it is locked in position by the use of the plate **B.** This plate is fastened to the metal body by machine screws. The body is made of a thick strip of cold rolled steel, and the handle is made of hardwood. The upright **C** is made round and is of the same height as the handle, so that the tie-bar **D** can be properly attached. The tool will facilitate rapid filing of flat-surfaced work, and is particularly valuable in connection with the filing of rods and frame jaws of locomotives.

Using Chuck For Toolholder

By C. R. DILTHEY

WE recently had to machine five large frame castings, for which the only machine available was a 26-in. lathe. Each casting in turn was clamped to the carriage of the lathe, where the bearings were bored by

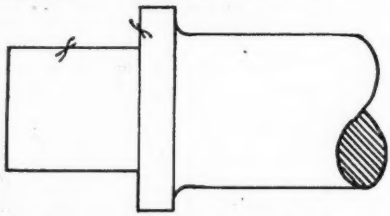


Fig. 1—Drawing of flanged hub.

using a fly-cutter in a bar that was swung between the lathe-centers, and the flanged hubs on either end of the casting were turned by means of a tool held in a chuck as shown in Fig. 2. The chuck was fitted with an extra long adapter by which it could be anchored to the bar referred to above. All the jaws were removed from the chuck and to one jaw-base was bolted a block to carry the tool, as shown at **A.** Two of the jaw-bases were tightened against a heavy steel ring, as shown at **B,** the jaw-base carrying the toolblock being tightened against the

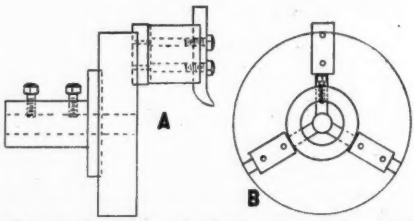
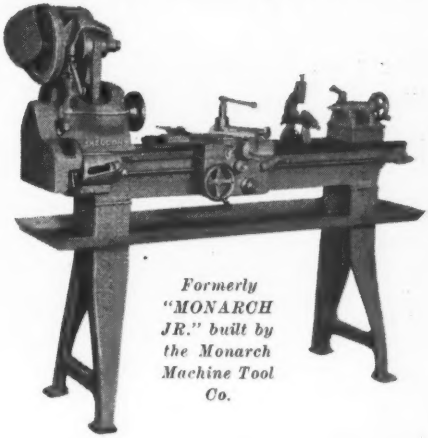


Fig. 2—Drawing of chuck adapted to hold turning tool.

head of a heavy setscrew in the ring so that the tool could be adjusted and still be properly braced. This equipment served very well as an emergency outfit, producing a good job.

The SHELDON 11-in. Lathe



Formerly "MONARCH JR." built by the Monarch Machine Tool Co.

Saves Power—Cuts Costs!

WOULD you use a 15 h. p. motor to run a 3 h. p. job? Of course not—the wasted power would be too expensive!

But, that is exactly what you are doing when you put a small lathe job on a large tool—wasting power and running up your costs! Eliminate this waste—install a SHELDON 11" lathe.

This lathe is built to close precision limits and will perform *accurately* the same functions as larger lathes. It is furnished in 3-ft., 4-ft., and 5-ft. bed lengths with either full-quick change gear attachment or semi-quick change gear attachment, cone or individual motor drive.

You can't afford to overlook the possibilities of the SHELDON 11" Lathe in your shop—investigate its advantages! Send for an illustrated bulletin!

	CONE DRIVE		MOTOR DRIVE*	
	On Bench Legs	On Floor Legs	On Bench Legs	On Floor Legs
11" x 3'	$325.00	$330.00	$405.00	$410.00
11" x 4'	335.00	340.00	415.00	420.00
11" x 5'	345.00	350.00	425.00	430.00

*Includes ½ H. P. Motor and Starter

Sheldon Machine Co.

3253-55 Cottage Grove Ave. CHICAGO, ILLINOIS

Over the Editor's Desk

Are You Feeding a Herd of White Elephants?

IT IS said that when an Eastern potentate wishes to take a polite way to ruin one of his subjects, he presents the offending subject with a white elephant. The recipient of the gift dare not sell or give away his ruler's present, and as the white elephant is sacred, he dare not kill it. So he has to feed it as long as he has anything left that can be converted into hay for the elephant.

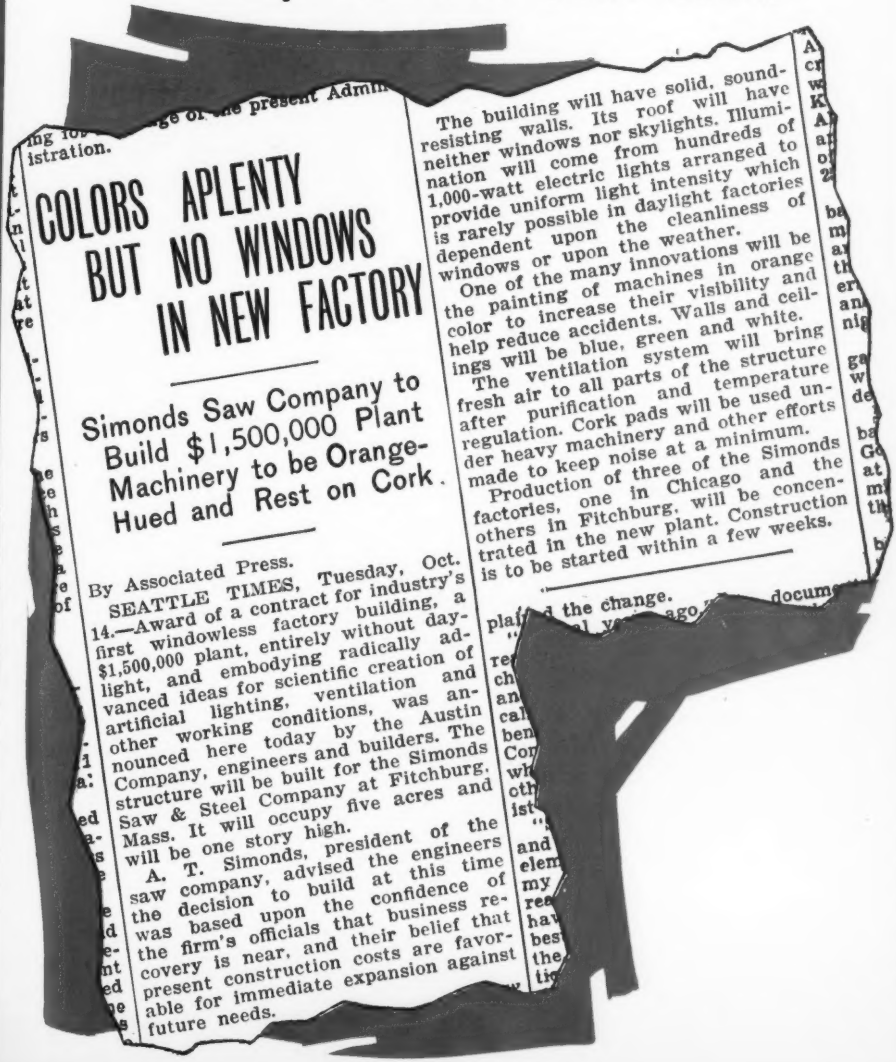
It is safe to say that there is hardly a machine shop in the country that is without one or more "white elephants" in the shape of machine tools that have outgrown their usefulness. It may be a worn-out lathe, or an old slotter, or an antique planer, but whatever it is, if it is a machine tool of ancient vintage, it is a "white elephant" and is costing the owner more than he can afford to keep it. In many cases the owner knows that the old machine is taking up more room than it is worth and will deliver only a fraction of the production that could be obtained from a more modern machine, but when he looks it over he is impressed with the size of it—especially if it is a large machine such as a planer or boring mill — or is one of those individuals who save everything, regardless, because they might find a use for it sometime, and so he puts off replacing it and there it stands.

What he does not see, as he looks at that old machine, is that instead of being an asset, it is a liability. It is eating its head off in overhead, floor space, and maintenance. It will still run and perhaps deliver as much production as it ever did, to be sure, but that may not be enough. The East Indian's elephant will run, too, but no salesman for an American firm would think of starting across country on an elephant after an order. Not with competitors going after that same order in trains, fast automobiles, and 100-mile-an-hour airplanes. The elephant is just as fast as it ever was, but modern methods of travel have rendered it too costly. And the same applies to the obsolete machine.

The old machine is costing too much to operate because the same tasks can be performed easier, more accurately, and at much lower costs with more modern equipment. In many cases, work for which several machines of older design have been required could be handled on perhaps one-half or one-third as many modern machines and enough saving could be made in labor costs and overhead to pay a substantial part of the cost of the new equipment, besides releasing valuable floor space for other uses. It should be remembered that each additional machine not only requires an operator, but also entails expense in the way of power, light, tools, perhaps crane service, supervision, insurance, and maintenance for the machine as well as for the three first-named items.

Go through your shop today and make a list of your "white elephants" —machines that are eating up more than they can earn in maintenance and overhead charges, and that are losing money for you through slow and unprofitable operation. Then get figures on production with up-to-date equipment and find out what savings can be made and what it would actually cost to replace these "white elephants" with modern machines. You will find that it wouldn't cost so much, after all, and your plant will again be equipped to maintain a competitive pace.

Did You Read The Windowless Factory Story in Your Newspaper? Building Now is Just The Right Thing To Do To Help Business Come Back.



COLORS APLENTY BUT NO WINDOWS IN NEW FACTORY

Simonds Saw Company to Build $1,500,000 Plant Machinery to be Orange-Hued and Rest on Cork.

By Associated Press.

SEATTLE TIMES, Tuesday, Oct. 14.—Award of a contract for industry's first windowless factory building, a $1,500,000 plant, entirely without daylight, and embodying radically advanced ideas for scientific creation of artificial lighting, ventilation and other working conditions, was announced here today by the Austin Company, engineers and builders. The structure will be built for the Simonds Saw & Steel Company at Fitchburg, Mass. It will occupy five acres and will be one story high.

A. T. Simonds, president of the saw company, advised the engineers the decision to build at this time was based upon the confidence of the firm's officials that business recovery is near, and their belief that present construction costs are favorable for immediate expansion against future needs.

The building will have solid, sound-resisting walls. Its roof will have neither windows nor skylights. Illumination will come from hundreds of 1,000-watt electric lights arranged to provide uniform light intensity which is rarely possible in daylight factories dependent upon windows or upon the cleanliness of windows or upon the weather.

One of the many innovations will be the painting of machines in orange color to increase their visibility and help reduce accidents. Walls and ceilings will be blue, green and white.

The ventilation system will bring fresh air to all parts of the structure after purification and temperature regulation. Cork pads will be used under heavy machinery and other efforts made to keep noise at a minimum.

Production of three of the Simonds factories, one in Chicago and the others in Fitchburg, will be concentrated in the new plant. Construction is to be started within a few weeks.

SEE HOW TOO HA

What to some other saws is a very difficult metal cutting task, is just another every day duty for the SIMONDS RED STREAK INSERTED TOOTH SAW. For some time, now, we have been telling mechanics, who cut metal, about the dependable, sustained service these SIMONDS RED STREAK SAWS render at a big saving in time and expense to the industry. As another proof we show two illustrations from photographs taken under every-day cutting conditions in the plants of the Union Drawn Steel Co., of Beaver Falls, Pa.

The photograph in the circle shows a SIMONDS RED STREAK No. 0 Saw 29 inches in diameter cutting 13 nested pieces of $1\text{-}^{15}/_{16}$ inch round, 10-20 S. A. E. 15-25 Carbon Drawn Steel at a $2^{1}/_{4}$" feed per minute.

On regular stock (easier t
feed continuously.

The No. 2 illustration, fro
the same plant, shows SIM
inch saw, No. 0, cutting 30
hexagon screw stock -13 c
ute feed.

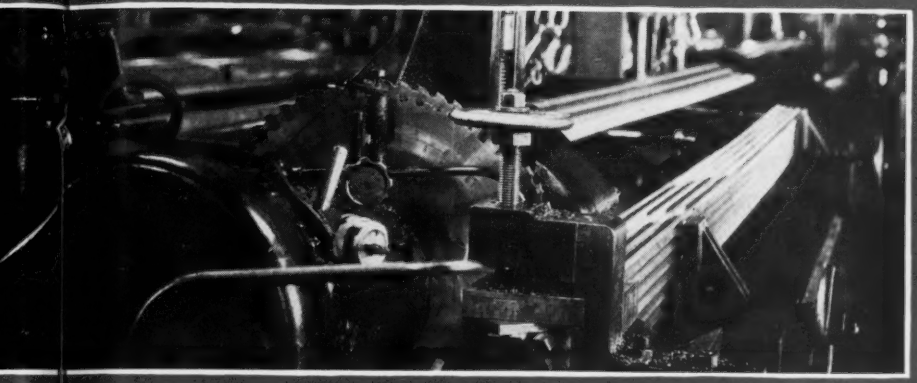
Men who cut meta for p
new design saw now. Let S
advise you. This service is yo

SIMO

SAW AND S

"The Saw Makers"

How Those Simonds Inserted Tooth Saws Slice Through Hardest Metal!



tock (easier to cut) they run $2^{5}/_{8}$ inch
sly.
llustration, from a photograph taken in
, shows SIMONDS RED STREAK 28
O, cutting 30 nested pieces of $1^{1}/_{4}$ inch
stock-13 carbon, at a 3 inch per min.

ut metal for profit should consider this
w now. Let SIMONDS ENGINEERS
his service is yours for the asking. Write

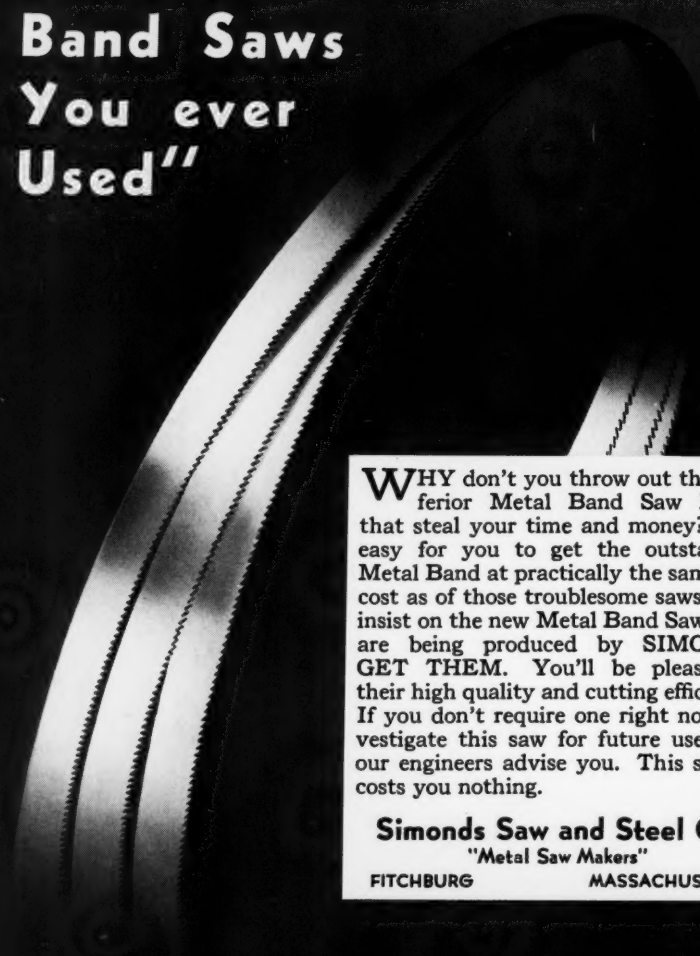
IMONDS
AND STEEL CO.
Makers"
Fitchburg, Mass.

WAPPAT MAKES NEW AND BETTER DRILLS

It will be to your advantage to find out about the electric drills which are being marketed by Wappat, Inc. They possess outstanding qualities of ruggedness and durability that guarantee satisfactory performance and longer life. Ask about Wappat "Red Streak" Drills. Write Wappat, Inc., 7522 Mead Street, Pittsburgh, Pa.

WAPPAT, Inc.
Division Simonds Saw and Steel Co.

SIMONDS - "The Finest Metal Band Saws You ever Used"



WHY don't you throw out those inferior Metal Band Saw Blades that steal your time and money? It is easy for you to get the outstanding Metal Band at practically the same first cost as of those troublesome saws. Just insist on the new Metal Band Saws that are being produced by SIMONDS. GET THEM. You'll be pleased at their high quality and cutting efficiency. If you don't require one right now, investigate this saw for future use. Let our engineers advise you. This service costs you nothing.

Simonds Saw and Steel Co.

"Metal Saw Makers"

FITCHBURG MASSACHUSETTS

SIMONDS

Metal Cutting Band Saw BLADES

New Shop Equipment

Sheldon 11-Inch Lathe

The Sheldon Machine Co., 3251 Cottage Grove Ave., Chicago, Ill., is now marketing an 11-inch lathe which can be supplied with either 3-foot, 4-foot or 5-foot bed, with either full quick change gear attachment or semi-quick change gear attachment, and with either cone and countershaft or individual motor drive. The Sheldon lathe is constructed of the finest materials and will perform, on a smaller scale, the same functions

Sheldon 11-Inch Lathe

as larger lathes. The machines are produced in large quantities by high production methods, and all parts are interchangeable.

The bed of the Sheldon lathe is of semi-steel and is of heavy design, providing unusual strength for a lathe of this size. The headstock is of the solid full-webbed bowl type, also unusually strong. All gears are completely covered. The spindle is of .50 carbon steel, accurately ground, has a 1 1/16-inch hole through its entire length, and has a nose of 1¼ inch diameter with an 8 P. thread. The spindle bearings are of high-grade phosphor bronze, the front bearing being 1 7/16 inch diameter by 2⅝ inches and the rear bearing being 1⅜ by 2 inches. The quick change gear box is of simple design, one tumbler lever operating on a cone of nine gears, compounding on the end with 32- and 64-tooth gears and with three other gears on the end gearing, giving fifty-four changes of threads and feeds. The thread range is practically unlimited. If preferred, a semi-quick change gear box can be furnished, providing three changes of feeds. The changes can be made while the lathe is running.

The tailstock is of massive design, with a base graduated for accurate set-over and so arranged that it can be considerably overhung to provide the maximum distance between centers. The compound rest is gibbed throughout and has large bearing surfaces. Cross feed dial, swivel, and compound rest dial are accurately graduated and numbered. The carriage is exceptionally large and heavy. It is 11¾ inches long and is carefully fitted and aligned to the bed. The cross bridge is 3¾ inches wide and is heavily reinforced, providing a good bearing surface for the cross slide. The carriage is securely gibbed to the bed and is drilled and tapped so that the taper attachment, chasing dial and chasing stock can be applied at any time. The apron is foolproof, locking of the feed and the half-nut at the same time being impossible. Feed and lead screw reverse are instantly secured by operating the reverse lever on the headstock. The countershaft consists of the Edgemont Friction Clutches and cast iron hangers, with ring oiling bearings. All parts are balanced to eliminate vibration.

The lathe can be furnished equipped for either motor or belt drive. For motor drive, a ½-h. p. motor is mounted on a bracket over the headstock, power being transmitted to an adjustable countershaft by means of a double-V belt. All belts, gears, and moving parts are carefully guarded. The weight of the lathe with a 3-foot bed is 630 pounds. Regular equipment includes large and small faceplates, tool post complete, centers, steadyrest, follower rest, wrenches, thread chasing stop and dial, and either countershaft for belt drive or motor, as the user requires.

Milwaukee Simplex Milling Machine

Kearney & Trecker Corporation, Milwaukee, Wisconsin, announces a production-type milling machine with spindle speeds as high as 1,000 r. p. m., basically designed for the higher cutting speeds and correct application of cemented tungsten carbide cutters. Either of three standard speed ranges, with twelve speed changes, is optionally furnished. The speed ranges available are 15 to 150 r.p.m., 30 to 300 r.p.m., and 100 to 1,000 r.p.m.

Milwaukee Simplex Milling Machine, Left and Right Side Views

An innovation in spindle quill construction is accomplished through a quill to the double overarms. This member, mounted at the extreme end of the quill, provides a strong stiffening support throughout the entire cross adjustment. When the spindle quill is moved outwards, the quill brace goes with it, thus furnishing "adjustable rigidity" to the spindle and cutters. The spindle quill is made from a steel forging, heat-treated, hardened, and ground. It is seven inches in diameter and has seven inches of longitudinal or cross adjustment. Cross adjustment is by a hand-crank attached to the squared end of the shaft, located midway between these screws, and provided with a graduated dial. One turn of the adjusting shaft moves the quill .250 inch, the graduations being marked in divisions of thousandths of an inch.

The spindle drive is through heavily constructed herringbone gears. The design differs from the usual practice; instead of splining the large spindle gear and having it slide on the spindle, this gear is solidly mounted on the spindle and its driving pinion is splined. The spindle is mounted on three large roller bearings; two of these are of the tapered type located at the extreme ends of the spindle, and the third is of the straight design located on the inside hub of the spindle quill.

Extra strength for high cutting speeds is obtained by mounting the spindle block between heavy double uprights. The block has bearing surfaces for its full length, being guided and aligned by a deep tongued slide and held to adjustment with a full length gib. When the spindle block is clamped in place, the entire head becomes practically one solid unit. Vertical adjustment of the spindle block is by a handcrank located at the right side of the bed and convenient to the operator

STANDARD & SPECIAL DRILLING & BORING MACHINES

A complete line of standard upright drilling machines — single spindle and gangs —stationary and sliding head — belt and motor drive—with or without attachments.

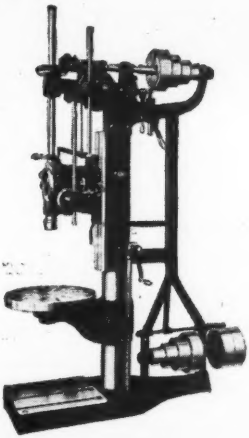
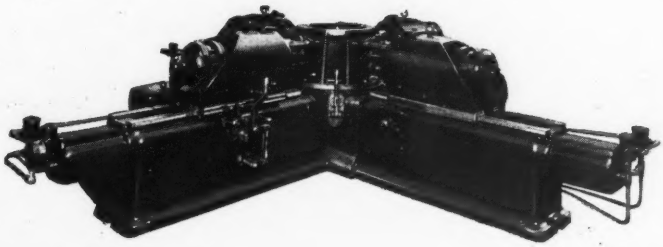


Illustration at left shows 26-inch Sliding Head Drill with Power Feed, Automatic Stop and Back Gears, arranged for belt drive.



Special single-spindle or multiple - spindle machines, working from one direction or several directions simultaneously, with or without indexing table; for high production and heavy duty drilling, boring, reaming and similar operations.

Above is shown a 4-way drilling and reaming machine with elevating fixture.

Write for booklet entitled "Performance."

A SERVICE WHICH GIVES HIGH PRODUCTION WITH LOW MAINTENANCE *by*

W. F. and John Barnes Co.

ROCKFORD, ILLINOIS

Established 1872

when setting his spindle either in or out, or up and down. A graduated dial, marked in thousandths of an inch, offers precision settings.

A striking feature of convenience is the co-ordinated adjustment for the arbor and overarm braces. When adjusting the cutters in or out, it is not necessary to disturb the independent relations of the arbor to the arbor supports and double overarms. The entire unit moves with the handcrank. All that it is necessary to loosen is the two bolts that clamp the overarms in the spindle block and the two bolts in the T-slots at the base of the outer arbor support, at the front of the bed.

An option of two ranges of 18 feeds is made possible, either from one-half to 20 inches or from one to 40 inches per minute. The feed changes are made at the front of the machine by pick-off gears located behind a hinged door. The power rapid traverse operates at 240 inches per minute.

Milwaukee Simplex Machines are offered in two series—1,200 and 1,800—the first two numerals designating table widths. The 1,200 series machines have tables 12 inches in width, with a choice of either eighteen, twenty-four, or thirty inches of table feed; and the 1,800 series machines have tables eighteen inches in width with table feeds of 24 or 30 inches. All tables are held in adjustment by a heavy gib running the full width of the bed.

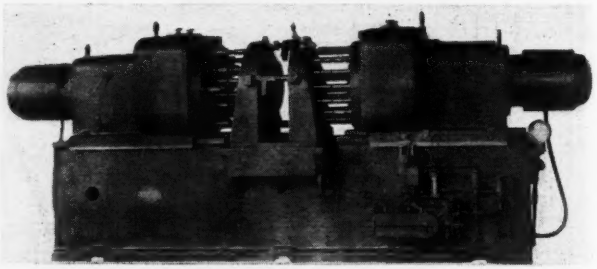
The machine is constructed from five major units; namely, the bed, the double uprights, the spindle block, the saddle, and the table. The bed of the machine, which is cast in one piece, contains all operating units, which include the motor, main driving clutch and brake, speed and feed gear units, coolant and lubricant pumps and reservoirs. Through the introduction of a heavy bolted saddle, all operating units of the table can be self-contained and made readily accessible for both adjustment and maintenance.

With the exception of the outer bearings of the table screw, the entire machine is automatically lubricated by a geared-type pump. The coolant is distributed by a large gear-type pump that operates automatically when the spindle is engaged. The pump is constructed with a low-pressure release valve so that a large quantity of coolant can be flooded onto the cutters at low pressure.

The machine has a multiple V-belt drive consisting of four belts. The motor is mounted on a pivoted bracket that can be adjusted to keep the bolts at a proper tension. All machines are arranged for motor drive to accommodate either 5 or 7½ h.p. motors. Net weights of the machine vary from 7,300 to 8,300 pounds, depending upon bed and table sizes.

Rockford Hydraulically-Operated Multiple Spindle Drilling and Tapping Machine

A combination multiple spindle drilling and tapping machine, the functions of which are hydraulically-controlled by means of an Oilgear pump, has been placed on the market by the Rockford Drilling Machine Co., 10 Catherine St., Rockford, Ill. It is said that the operation of the machine through this control is such that clean cut threads are secured and the danger of tap breakage is reduced to the minimum. The arrangement on the machine shown in the illustration has been in use for drilling and tapping large tractor gears for several months, and no tap breakage has been reported. The machine shown has nineteen spindles at one end and seventeen spindles at the other. All of these spindles are in use for drilling in one operation, then the drills are replaced with taps and nineteen holes are tapped



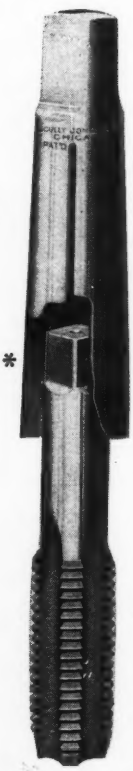
Rockford Hydraulically-Operated Multiple Spindle Drilling and Tapping Machine

"Scully-Jones" Tap Chucks

For

TAPS, DRILLS, REAMERS, WOODRUFF KEYWAY CUTTERS, END MILLS, Etc.

"DRIVE BY THE SQUARE—CENTER BY THE SHANK"



*Section removed to show position of tap in chuck.

TOOL ECONOMY

The Positive Drive reduces tool breakage.

Taps run true and cut uniformly, therefore, last longer.

PRODUCTION ECONOMY

Quick machine set up and tool changes: Simply insert tools in chucks, then into machine spindle. No fussing with jaw chucks, nor hunting of lost chuck keys. The rigid, non-slipping drive and smooth cutting action produce a better thread with **greater speed.**

Use on **multiple spindle machines** for close center drilling, reaming and tapping.

DETAILED specifications in our Small Tool Catalog No. 37, which describes our complete line of "WEAR-EVER" PRODUCTION TOOLS, will be gladly sent on request.

SCULLY-JONES & COMPANY

1909 S. Rockwell St. *Tool Division* Chicago, Illinois

FACTORY REPRESENTATIVES AND LOCAL STOCKS:

DETROIT, MICHIGAN	Gross & Heming, 1502 David Stott Building
CLEVELAND, OHIO	Cleveland Tool & Supply Co., 1427-1437 West Sixth Street
CINCINNATI, OHIO	The E. A. Kinsey Co., 331-35 West Fourth Street
NEW YORK CITY	L. C. Biglow & Co., Inc., 250 West 54th Street

in one side, with seven in the other. The tapped holes vary in size.

As shown by the illustration, each machine head is driven direct by a ball bearing motor. The drive is then through reduction gears to the main driver at the front compartment of the head, which accommodates the spindle-unit. The revolving parts in the head proper are mounted in Timken roller bearings, and run in a bath of oil. Drilling or tapping speeds are secured as desired through a clutch lever on each head. Each set of spindles is built up into a separate unit which fits into the front compartment of the drive head proper. The main driver of the head connects with the main drive spindle of the spindle-unit. The spindles are mounted in ball bearings and force feed lubrication is provided. This spindle-unit feature is of great advantage, as it permits of changing the spindle-units to suit the work. The heads are coupled together through a rack and pinion so that they work simultaneously.

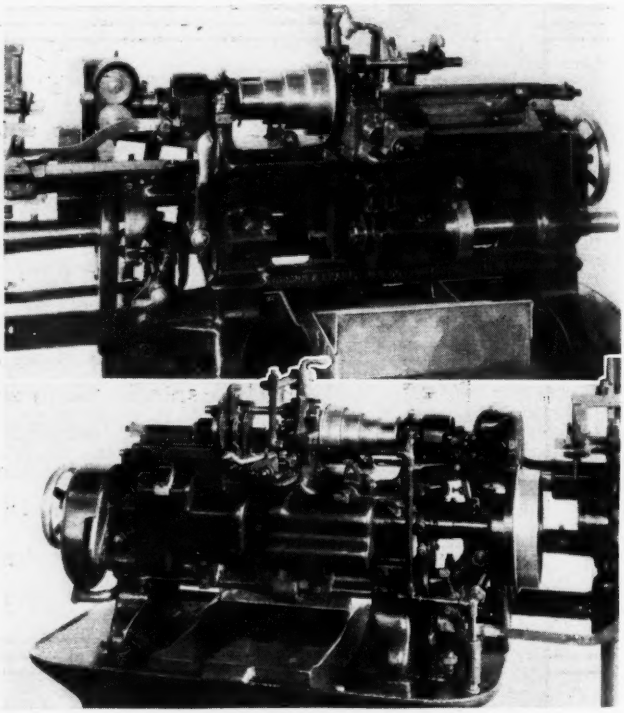
In operation, the heads rapid traverse to operating position and then automatically slow down to working feed rates. After drilling to a predetermined point, the heads rapid traverse to starting position and stop. The automatic operation is the same for tapping, except that the spindles reverse when the head reverses. The machine is provided with a sensitive stop so that if a blind hole or short hole is encountered in tapping, the pressure on the tap reverses the machine and the head returns to starting position, without damage to either taps or machine.

The machine can be furnished in several sizes and combinations.

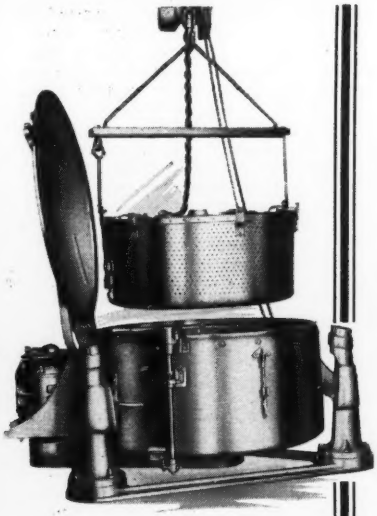
B. & S. Roller Feed and Timing Mechanism

The Brown & Sharpe Manfg. Co., Providence, R. I., announces a new attachment, called the Roller Feed and Timing Mechanism, to be used with Brown & Sharpe Automatic Screw Machines. On jobs where the pieces are of considerable length, this equipment saves much time, as one operation of the roller feed is sufficient to feed the piece the required distance, eliminating the multiple feedings with feeding fingers otherwise necessary. The end of each new bar is positioned at a point to permit trimming to remove the waste, leaving only a suitable amount of chucking at the last end.

To determine the position for trimming, a swing stop with control mechanism is used. This stop functions only once to each new bar. The operation



B. & S. Automatic Screw Machine Equipped With Roller Feed and Timing Mechanism



Let us show you how the Tolhurst Chip Wringer fits into your chip handling methods. The coupon below will bring a preliminary report, without the slightest obligation.

DRYER CHIPS

MORE OIL

GREATER PROFIT

ACTUAL cutting operations destroy precious little cutting oil. The new oil you buy goes to replace perfectly good oil which has gone out with the chips.

A Tolhurst Chip Wringer will recover that oil for you. AT A HANDSOME PROFIT. Moderate in first cost, requiring little labor and power, Tolhurst Chip Wringers handle big loads of chips, remove the oil at a cost far lower than you must pay for new oil.

TOLHURST
Chip Wringers

TOLHURST MACHINE WORKS, Inc.,
646 W. Fulton Street, Troy, N. Y.

Gentlemen: Please give me the facts on Tolhurst Chip Wringers. We handle about .....pounds of chips a day. The material is..... We prefer (line shaft) (individual) drive.

NAME .....

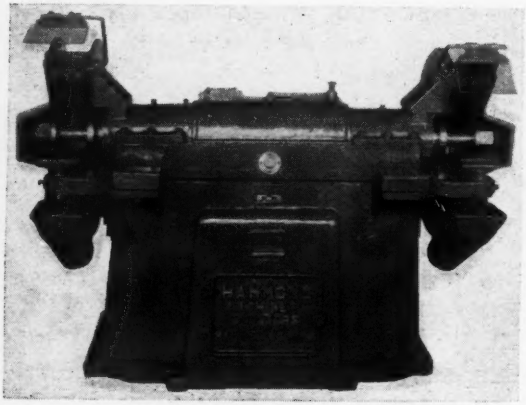
COMPANY..... ADDRESS.....

4407

of the swing stop is controlled by a ratchet wheel operated by a pawl which is moved by the rear cross slide each time a piece of work is cut off. The number of teeth in the ratchet wheel is a multiple of the number of pieces available in each 10-ft. bar. As an example, a ratchet has 44 teeth, and as 11 pieces are contained in each bar, 4 operating dogs are necessary. These dogs are mounted on the side of the ratchet wheel and when brought to a position allow the swing stop mechanism to function. When this trimming operation is completed, the bar is again fed to the stock stop which determines the correct length of each piece available in the bar. An automatic cutting-off machine equipped with roller feed and set up for producing long pieces is said to consume bars at a very rapid rate.

Hammond Select-O-Speed High Speed Grinder

A grinder in which herringbone gear and the Multi-V belt drive have been combined to provide a high operating efficiency for all snagging and rough grinding work has been developed by the Hammond Machinery Builders, Kalamazoo, Michigan. The grinder, which is known as the Select-O-Speed, affords an almost constant peripheral speed of 9,000 surface feet per minute, providing maximum grinding efficiency on Bakelite and rubber bonded wheels. The machine can, however, be arranged for use with vitrified grinding wheels. Wheels of 24, 20, 18, and 16-inch diameters can be used effectively. The machine is designed so that it can be driven by 7½, 10, or 15 h.p. motor.



Hammond Select-O-Speed High Speed Grinder

Power is transmitted from the motor, mounted at the rear, to an intermediate drive shaft by means of a Multi-V belt. The belt can be replaced when necessary without disturbing any part of the machine except the belt guard. Speeds are changed by means of quick change pulleys on the motor, protection being provided so that fast speeds cannot be used with large grinding wheels. The power from the intermediate spindle to the main spindle is transmitted by means of herringbone gears, operating in a bath of oil. Six oversize ball bearings, which are protected from dust, insure smooth operation of the spindle.

Wheel guards are made of boiler plate steel and are built in accordance with American Standards Association recommendations. The guards are adjustable to compensate for wheel wear, and are fitted with shatterless glass eyeshields. The machine spindles are of chrome nickel steel, ground and polished. The motor is fully protected from overload and low voltage phase failure.

New Series of Houghton Gear Lubricants

After extensive tests by the research staff of E. F. Houghton & Co., Philadelphia, Pa., a new series of gear lubricants for use with all types of heavy, slow-moving, open gears has been developed. The lubricants are to be known as Tenac No. 1, 2, 3, and 4. It is stated that these lubricants will not be thrown off the gears while they are in motion, which often happens in the case of lighter lubricants. The Tenac lubricants have been used in practically every type of gear installation and under most adverse conditions, meeting all requirements successfully. An outstanding advantage of the Tenac series of lubricants is their ability to operate satisfactorily at extremely low temperatures. No special device or method of application is required to use the Tenac series of gear lubricants.

BIG BALL BEARINGS ?
yes!- up to 18½-inch bore!

Norma-Hoffmann Angular-Contact Combined Radial and Thrust Ball Bearing
Norma-Hoffmann Radial Single Row Ball Bearing
Norma-Hoffmann Self-Aligning Double Row Ball Bearing

The size you need—the type you require—with the PRECISION that means extra value in the way of longer life and higher efficiency.

●

"NORMA-HOFFMANN" PRECISION BALL BEARINGS

The three standard types, pictured and detailed above, are available to you in a range of sizes to meet your needs. All are marked by that NORMA-HOFFMANN Quality which means extra speed-ability, extra load-ability, extra service-ability. *Better Bearings* for those seeking *Better Service.*

Write for catalogs. Let our engineers help you.

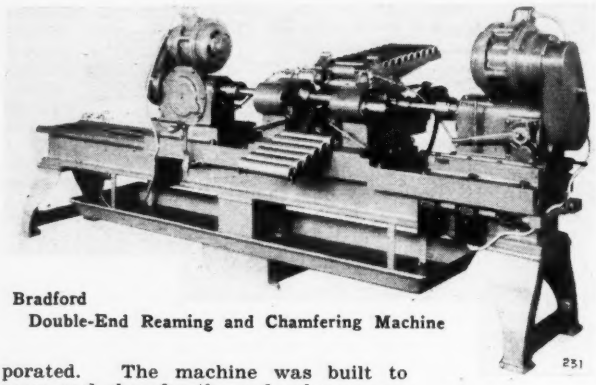
NORMA-HOFFMANN BEARINGS CORPORATION STAMFORD, CONN., U.S.A.

PRECISION BALL, ROLLER AND THRUST BEARINGS

BB-10

Bradford Double-End Reaming and Chamfering Machine

The Bradford Machine Tool Co., 659 Evans St., Cincinnati, Ohio, has developed a double-end reaming and chamfering machine in the design of which a number of unusual features are incorporated. The machine was built to ream and chamfer the ends of conveyor rollers. These rollers are 2½ or 3 in. in diameter and vary in length from 6 in. to 48 in. All sizes are reamed to 1.580 in. with a $\frac{1}{16}$ in. chamfer.



Bradford
Double-End Reaming and Chamfering Machine

The machine consists of a bed upon which are mounted two No. 5 Bradford automatic single spindle drill heads arranged to work in conjunction with an automatically-controlled magazine fixture. Half of the magazine fixture and one head are mounted in a fixed position on the bed, while the other half of the fixture and the other head are adjustable to accommodate the various lengths of rolls to be machined. The machine is fully automatic, an operator being required only for observation and inspection.

The three motors which operate the two drill units and coolant supply system are controlled by a single push button, independent switches with overload and underload protection being provided for each motor. To operate, the operator engages the feeding mechanism of the master head by lifting the lever shown on the side of the right-hand unit. A cam-operated control valve opens the air supply line, allowing the air to pass to the cylinders which control the transfer fingers of the magazine end, as these fingers advance, they carry one roll into working position. After the pistons which operate the transfer fingers have completed their strokes, the air is by-passed to operate the mechanism which centralizes and clamps the work in position. The air supply also passes to an air-operated tripping unit attached to the feed lever of the second drill head and as the clamping of the piece is completed, the spindles of the drilling units advance in rapid traverse, slow down to a feed of .040 in. per rev. for the reaming operation and then again slow down to a feed of .005 in. per rev. for the chamfering operation, after which both spindles return in rapid traverse to the starting point.

After the tools have been withdrawn from the work, the cam on the master head again actuates the automatic control valve, cutting off the air supply and opening the feed lines of the fixture to the exhaust. The transfer fingers are carried back to the starting point, after which the clamping cylinders are opened to the exhaust and the piece is ejected. This cycle continues indefinitely until the operator stops the machine. The reamers are operated at a speed of cutting 100 ft. per min., and the operating cycle of the machine is 6 seconds. The machine can be adapted for use on any parts that require double-end machining operations and which are designed to facilitate magazine feed.

American V-50 Vertical Broaching Machine

The illustration shows a Type V-50 broaching machine which was built by the American Broach & Machine Co., Ann Arbor, Michigan, for use in a large tractor plant. The machine as shown is tooled up for broaching the teeth in internal gears 6 in. diameter with 30 teeth. Three of the gears are shown on the floor at the base of the machine. The front splash guard on this machine has been removed so that the broach can be seen. The gears are 2 in. thick, and each gear is broached in 20 seconds, the operation being completed at one

Like a Giant Hand...

Berjo Holds Odd Shapes Immovable!

When you have a small run of twenty-five, fifty, or a hundred pieces for your drill press, milling machine or shaper . . . you don't need an expensive jig or work holding fixture! Put a BERJO Vise on the job . . . it holds any shape . . . no matter how irregular . . . with a giant-like grip.

The design of the BERJO Vise is new . . . radically different . . . yet extremely practical. Instead of using solid steel jaws, as used in the ordinary vise, compensating jaws are used, backed up with free-flowing steel balls. These balls instantly shift position when the vise is closed, allowing the jaws to conform to the contour of the work and distribute equal pressure on all sides of the piece.

Look around your shop . . . find out where you could use a BERJO. Then send the coupon for illustrated bulletins . . . they will suggest many more uses!

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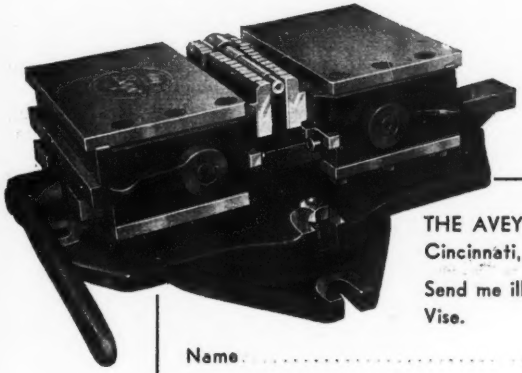

THE AVEY DRILLING MACHINE CO.,
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Send me illustrated bulletins on the BERJO Vise.

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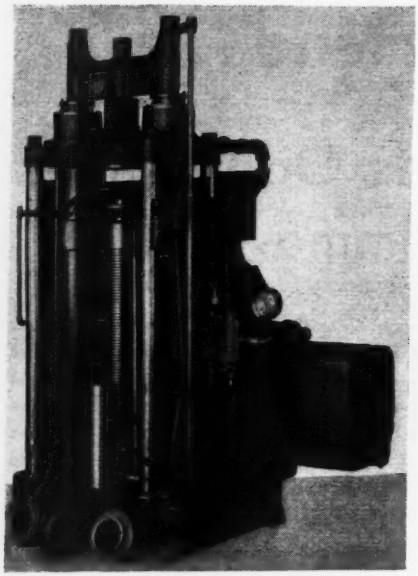


American Type V-50 Vertical Broaching Machine Equipped For Broaching Internal Gears

pass of the broach. The machine has a capacity of 50 tons. The broach, which was also manufactured by this firm, weighs approximately 440 pounds. The operator is not required to handle the broach as it is replaced in position by the machine-ram.

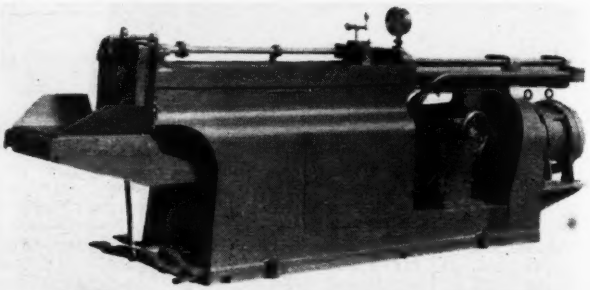
Oilgear Type "XL-12" Horizontal Broaching Machine

The Oilgear Company, 680 Park St., Milwaukee, Wis., announces the new type "XL-12" horizontal broaching machine, which is said to be well adapted for high speed broaching of small and medium size parts. The outstanding features of the machine are sturdy construction, convenient control, adjustable pulling speed, high return speed, and the ability to work to closer limits on finished parts.

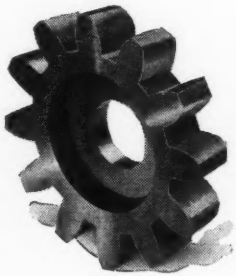
The power unit of the XL-12 machine consists of an Oilgear Type WSG-6 variable delivery pump, mounted in the frame as an integral part of the machine. The pump is operated at a maximum speed of 860 r.p.m.; has a maximum delivery of 4,800 cu. in. of oil per min. at a maximum working pressure of 1,000 lbs. per sq. in. and a peak pressure of 1,250 lbs. per sq. in. The Oilgear multiple plunger pump delivers a smooth flow of oil under pressure in direct proportion to the pull required for broaching, and the oil displacement is practically positive against any resistance up to the maximum capacity. Automatically-operated relief and by-pass valves protect the machine work and tools against overload. All heavy thrusts are carried on roller bearings, and all parts are easily accessible. A convenient hand wheel on the pump controls the amount of oil delivered and the speed of the draw head.

The control mechanism of the "XL-12" broaching machine consists of a simple hand lever and double foot pedal. Use of the foot pedals to start and reverse the draw head leaves the operator's hands free to serve the machine. The draw head can be stopped and started instantly at any point of its stroke by moving the hand lever or depressing the foot pedals, and it stops automatically at the end of the stroke. The draw head is screwed onto the ram and is guided by bronze liners on large flat steel ways. The cylinder is of seamless steel tubing, and is accurately bored and honed. Cast iron piston rings are fitted to the cylinder. The pump, which is belt-driven, delivers fourteen gallons of coolant per minute to the broaching tools.

The machine has a normal pulling capacity of 12,000 lbs., with a peak ca-



Oilgear Type "XL-12" Horizontal Broaching Machine



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The Fellows Gear Shaper Cutter is more than a chunk of high-speed steel with teeth on it; it is a precision product, made as accurately and carefully as human skill and special precision machinery can produce it.

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Most progressive manufacturers have standardized on Original Fellows Gear Shaper Cutters, because they produce good gears at the lowest possible cost.

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pacity of 15,000 lbs. Pulling speed is variable from 4 to 33 ft. per min. Maximum return speed is 70 ft. per min. Maximum stroke, 48 in. Diameter of holes in faceplate, 4 in. Distance between ways, 7 in. Vertical adjustment of crossheads, 1⅝ in. above or below the centerline. Floor space required, 25x147 in. Net weight, 3,600 lbs. The machine is operated by a 10 h.p. 860 r.p.m. constant speed motor, as shown in the illustration, or by a flanged-type motor which can be bolted to the end of the frame.

"Thor" High Frequency Electric Tools

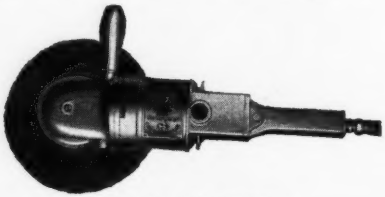
Six new tools have been added to the line of Thor High Frequency Electric Tools made by the Independent Pneumatic Tool Co., 236 South Jefferson St., Chicago, Ill. These tools are of the midget type, and are made in two styles —bonnet and grip switch. The bonnet

Thor High Frequency Electric Drills. (Above) Bonnet Type. (Below) Grip Switch Type.

type fits in the palm of the hand and, being light, is easily handled. The grip switch type provides a handle for those who are used to tools of this type. These small electric drills are especially designed for fast, accurate drilling. The bonnet type drill is made to operate at either of three speeds as follows: AMC (illustrated), 2,300 r.p.m.; AMB, 2,790 r.p.m.; and AMA, 3,700 r.p.m. The capacity is ¼ in., and the weight is 3 pounds. Length overall, 9½ inches. The grip switch type is also made in three speeds as follows: AMC (illustrated), 2,300 r.p.m.; AMB, 2,790 r.p.m.; and AMA, 3,700 r.p.m. The capacity of this tool is ¼ in., and the weight is 4 lbs. 1 oz. The overall length is 9½ in.

"U. S." Portable Polisher

For waxing and polishing, the "U. S." portable polisher, made by the United States Electrical Tool Co., 2471 West Sixth St., Cincinnati, Ohio, is said to reduce by a considerable margin the



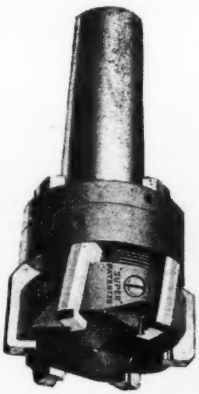
"U. S." Portable Polisher

time required to perform such operations by hand. A powerful universal motor, for either alternating or direct current, turns the polisher at a speed of 900 r.p.m. The motor will operate from ordinary lighting current from any light socket. The tool is ball bearing throughout, and weighs 11 pounds. It is supplied complete with cord, plug, one lamb's wool pad and one felt pad.

Oxweld No. 22 S. D. Steel Welding Rod

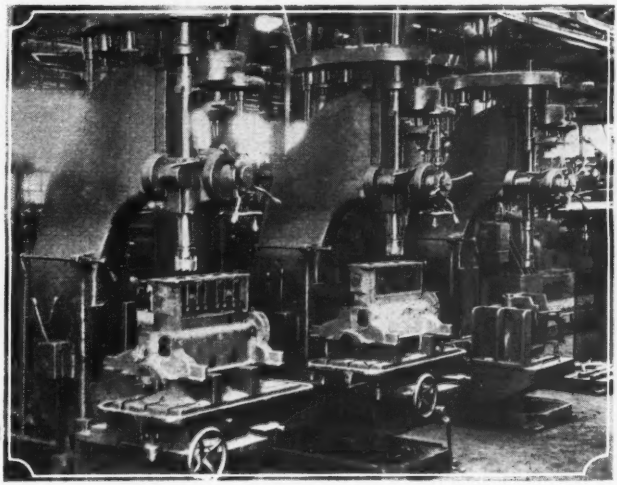
Oxweld Acetylene Company, 30 East 42nd St., New York, N. Y., has placed on the market a welding rod for making extremely strong welds in steel, designated as Oxweld No. 22 S. D. steel welding rod. This rod has been developed especially to meet the demand for 100 per cent joints in steel pipe having a carbon content of 0.30 to 0.40 per cent, which has recently come into general use. In appearance, weldability, and chemical and physical properties the rod is similar to the Oxweld No. 1 high test rod, but will produce welds of higher tensile strength.

No. 22 S. D. Welding Rod is a self-fluxing and deoxidizing rod which sparks very little. It forms a fusible slag that rises to the surface where it serves as a protective coating which, although extremely thin, protects the surface of the molten bath from the oxygen of the air and thus prevents oxidation. The composition of the rod also prevents the strengthening element, carbon, from burning out during the welding operation. It has the ability to fuse easily into the base metal at both



IT'S THE REAMER

that has to maintain the close accuracy



Line-up of machines equipped with McCrosky - SUPER Reamers for reaming tractor cylinders.

GETTING down to fine points, final responsibility for holding finished holes to such close limits as plus .000 and minus .0005 rests upon the reamer with which your machine is equipped.

These are the limits within which the McCrosky-SUPER Reamers have to perform on this job of reaming the cylinders of a world-famous tractor. They perform the last operation before honing.

This is only one of many jobs where the accuracy of McCrosky-SUPER Reamers is depended upon to protect the investment in time and material that precedes the reaming operation. If you need to maintain close accuracy in holes, investigate the advantages of these sturdy tools.

Bulletin No. 12-A shows all styles of standard McCrosky - SUPER reamers and examples of special reamers and line bars made by McCrosky. Send for a copy.

McCROSKY TOOL CORPORATION

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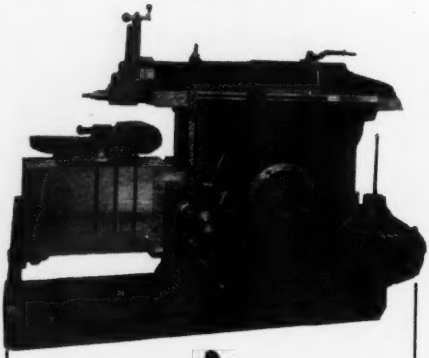

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FOR downright dependability to perform economically under all conditions, records show that the COLUMBIA SUPERIOR SHAPER ranks first in scores of plants throughout the country.

Some of the COLUMBIA features which make such a record possible are: massive column and base, heavy arch ram, extra large table with outer support, hardened alloy-steel drive gears, flood lubrication, all parts proportioned for maximum strength and durability.

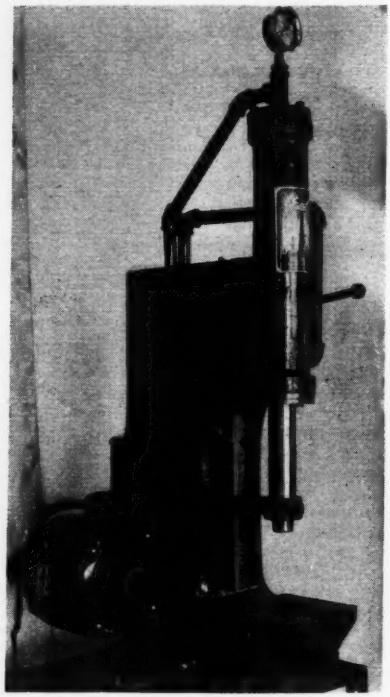
For full details send for BULLETIN 17!

THE COLUMBIA MACHINE TOOL CO.
HAMILTON OHIO

the sides and the bottom of the vee, producing a strong weld. The rod is available in $\frac{3}{16}$-in. and ¼-in. diameters in 36-in. lengths.

American Hydraulic Bench Arbor Press

The illustration shows the "American" hydraulic bench arbor press, to be known as the "V-O," which has been placed on the market by the American Broach & Machine Co., Ann Arbor, Michigan. The machine is operated as a self-contained unit, and is intended



"American" Hydraulic Bench Arbor Press

to fill the demand for a small hydraulic press that can be attached to a bench or lathe bed. The machine is driven by a ½ h.p. motor, power being transmitted by means of a roller chain. The maximum pressure obtained is one ton.

The pump is mounted directly in the column, where it is submerged in the oil. The column serves as an oil res-

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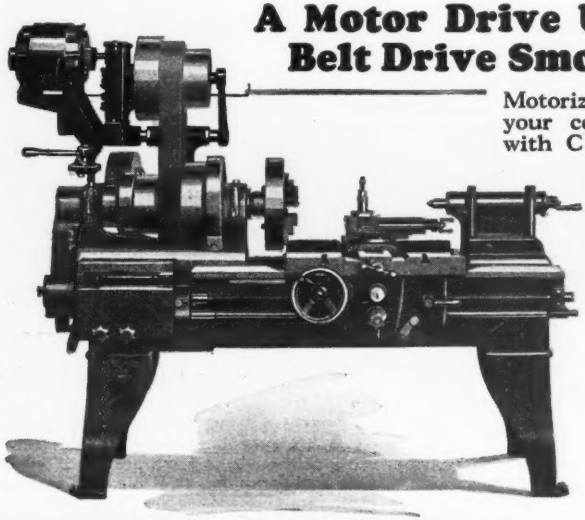

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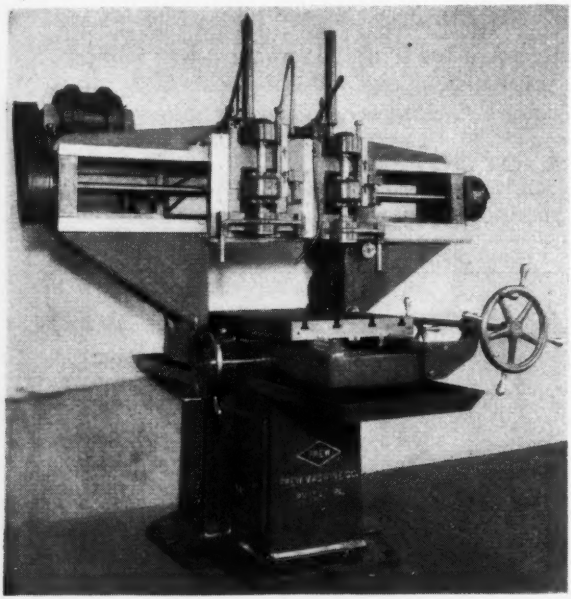
Cullman Wheel Co. 1336 Altgeld St. Chicago, Ill.

ervoir, having a capacity of four gallons. The pressures exerted are indicated at all times by direct reading gauge. The total height of the machine is 41 inches. The ram, which is 2 in. in diameter, operates at a speed of 60 ft. per min., and has a stroke of 12 inches. The width of the operating slot in the table is 2½ inches.

Frew No. 7 Spiral-Gear-Driven Profiling and Milling Machine

The Frew Machine Co., 122 West Venango Street, Philadelphia, Penna., has placed on the market a heavy duty profiling machine, known as the No. 7, which can also be used as a vertical miller. The machine is intended for use primarily to mill irregular shapes or surfaces or for heavy spotting at irregular heights, as all feeds are hand-controlled. The motion of the table, which moves on large Vees, is controlled by means of a handwheel at the side, operating through a gear box which, in turn, meshes with the rack on the bottom of the table. The overhead arm carries the spindle mechanism and driving shafts. A rear shaft carries either the sprocket for the motor drive chain or pulleys for belt drive, the opposite end of the shaft being provided with a pick-off gear that meshes with a similar gear on the front drive shaft, thus providing for speed changes.

The spindles are driven through hardened and ground steel spiral gears, and are provided with Timken tapered roller bearings with provision for take-up for wear. The cross movement of the spindles is controlled by means of the handwheel at the front of the machine, operating through gearing on the rear of the machine and meshing with a rack on the cross-slide. The vertical movement of the spindles is obtained by hand levers, the spindles being counterbalanced by springs. A lock box is provided for each spindle unit, latching into the lock bars so that when the spindle is pulled down to a desired point, it is automatically locked. The adjusting screw on these lock bars is provided with graduated dial for fine adjustment. Former pins are provided for each spindle.



Frew No. 7 Spiral-Gear-Driven Profiling and Vertical Milling Machine.

The table has a working surface of 37x20¾ in., and a movement of 36 in. The range of the cross slide is 27 in., and the vertical movement of the spindle is 4 in. Distance between uprights, 25½ in. Height between table and cross slide, 12 in. Center distance between spindle and guide pin, 7 in. Spindle speeds, 150 to 840 r.p.m. Horsepower required, 3. Floor space required (one spindle machine), 96x72 in. Weight, 4,200 lbs.

Wedge-Lock Production Vise

The Wedge-Lock Tool Company, 2523 N. Keeler Avenue, Chicago, Ill., has added to its line a production vise for use with milling machines and drill presses. The vise employs the Wedge-Lock principle on the moveable jaw. There are three units of Wedge-Lock tapers, located at each end and in the middle of each jaw. These wedges are of the same

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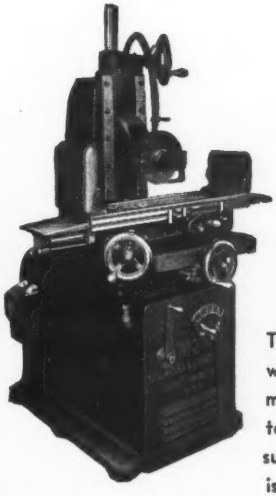

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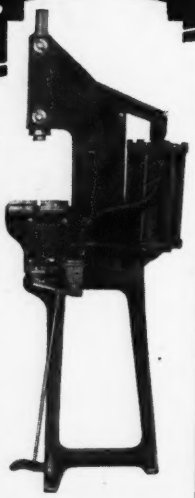

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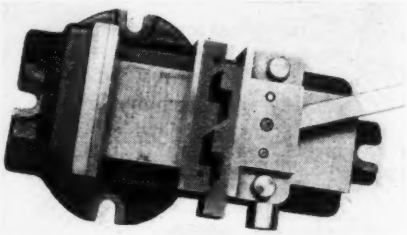
depth as the vise-jaw, which results in a positive, uniform parallel pressure between all points of the two jaws. The result is that work of any contour, even a sphere, may be clamped rigidly at any point between the jaws. The action of the jaws and locking wedge is such that parts may vary in outside contour as much as ⅛ in., and still lock rigidly, which is of great advantage when machining castings.

The opening between jaws may be set to accommodate work of varied sizes by setting the moveable jaw in position. This is accomplished by engagement of the clamp blocks at either end of the jaw with the rack at the sides of the vise body and tightening the bolts. The action of the lock is very simple; the first seven degrees of pull on the lever moves the jaw forward, taking up the loading space, and any further movement of the



Wedge-Lock Production Vise

lever is locking action. Jaws of all vises will open an amount equal to the width of the jaws, and will lock any work within that limit. One complete throw of the lever will move the jaw an amount equal to about four turns of a screw and the movement is almost instantaneous.

Booklet on Norma-Hoffmann "Greaseal" Felt-Protected Ball Bearings

An outline of the advantages of Norma-Hoffmann "Greaseal" Felt-Protected Ball Bearings is given in a booklet which has been issued by the Norma-Hoffmann Bearings Corporation, Stamford, Conn. The booklet describes the bearings in detail and includes tables of the sizes and dimensions of the complete line, with load ratings and mounting dimensions. Cross section drawings illustrating a number of typical applications are also included. Copy free to any machine shop executive upon request.

Correct Tool Pressure Angle Cuts Production Costs!

The offset between the spindle center and the center line of the bed means that tool pressure will react on the inside of the front vee on all work—even the larger diameters.

Correct tool pressure angle eliminates chatter, allows the lathe to be run at higher speed, and produces better work—all of which cut production costs.

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THE GREAVES-KLUSMAN TOOL CO., Cincinnati, Ohio

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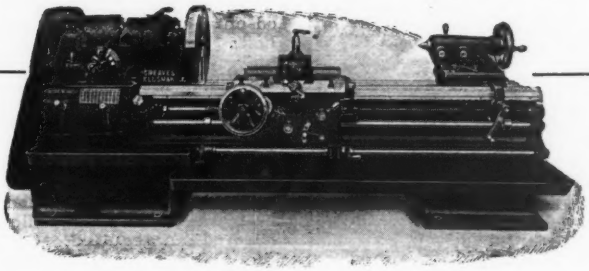

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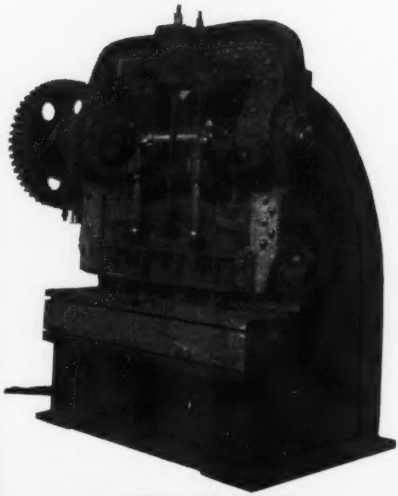

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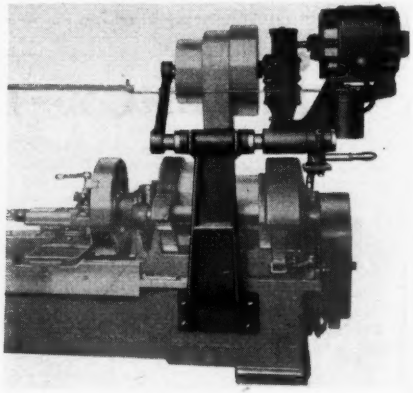
Cullman Lathe Drive

The Cullman Wheel Co., 1336 Altgeld Street, Chicago, Ill., has developed an individual motor drive unit which can be attached to any lathe with a cone pulley. The drive, which is shown in the illustration, consists of a bracket carrying a foundation shaft upon which is mounted the electric motor and reversible drum switch, the Cullman speed reducer with shaft extension to carry the cone pulley, the arm carrying the raising and lowering device for easy belt shifting and adjustment for belt tension, and the arm that carries the ball bearings for the cone pulley shaft. The bracket is mounted on the back side of the lathe by four bolts and is supported at the front by an adjustable leg to the headstock.

The motor is direct-connected to the reducer and the first speed reduction is by chain and sprockets. Further reduction is obtained by spiral gearing, all shafts running in Timken roller bearings. The gears are of hardened and ground steel. The belt is shifted by a device with which the upper pulley is raised and lowered as required. On the 1 and 2



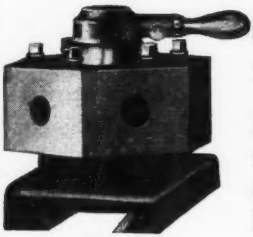
Cullman Lathe Drive.

h.p. units the belt-shifting device lowers the cone pulley 1 in. and on the 3 and 5 h.p. units it lowers the pulley 1¼ in. to facilitate easy shifting. The upper cone pulley is, of course, the original countershaft pulley.

The reducer is filled with oil to a certain point and the chain in passing through the oil keeps all running parts well lubricated. No further oiling is required and the oil reservoir may need at-

STANDARDIZED

LATHE TURRETS



8 Styles

12 Sizes

For any make or size of Lathe, old or new.

STYLE "O"
Hexagon head, for round shank tools and bolted on fixtures.

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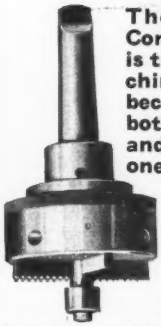
FAY & SCOTT

DEXTER, MAINE

Improves Accuracy and Reduces Time!



The Mummert-Dixon Compound Spot Facer is the ideal tool for machining small bosses because it combines both roughing cutters and finishing cutters in one tool.

The serrated roughing cutters quickly and easily remove the hard scaly surface cutting the work to approximate size, and are withdrawn without stopping the machine. Then, the finishing cutters shave off the serrated surfaces and finish the boss to accurate size.

The result is an accurate and smooth surface obtained in less than half the time required by other methods.

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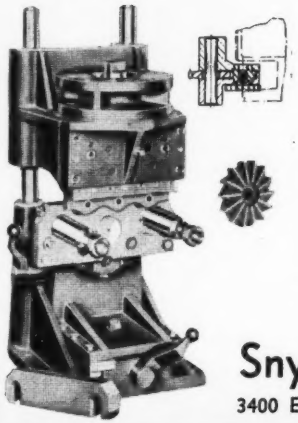
Snyder Adaptability
solves hard problems!



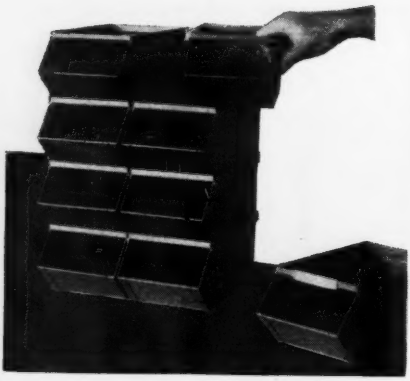
No matter how difficult or complicated your problem is, a Snyder Tool Set-Up can be adapted to your job and cut your tool costs.

Here is a Snyder Tool Set-Up for doing a light milling job. This special milling head and Snyder Fixture are used for back facing three small bosses at one time.

Look around your shop. Perhaps you have similar jobs on which a Snyder Tool will save you the cost of an expensive machine and give you greater production. Call on our engineers for suggestions.

Snyder Tool & Engineering Co.

3400 EAST LAFAYETTE AVENUE DETROIT, MICHIGAN



HOW THESE NEW BINS ARE REDUCING COSTS

In hundreds of plants the new Simplex Nesting Bin already is reducing machining and assembling time.

Built up on an assembly bench or along side a machine, they place more parts within convenient reach of the workman making it possible for him to do more work in the same amount of time—and with less effort.

They are also reducing handling time between operations, and on final operations can be delivered from operation to stockroom where they provide their own storage space. Made in four standard sizes, but can be furnished in any size desired.

Bin No.	Width	Height	Length
1	5½"	4"	12"
2	7½"	5¼"	15"
3	9"	6½"	18¼"
4	12"	9½"	20"

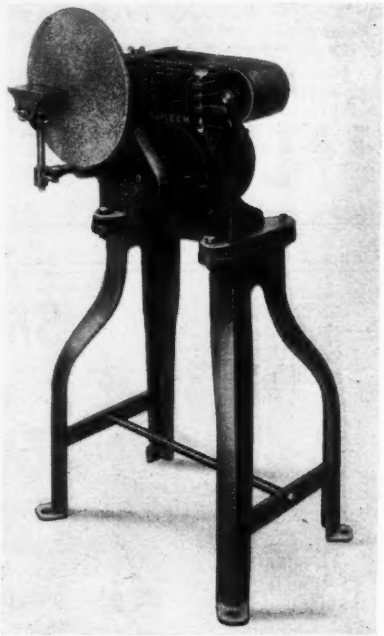
SIMPLEX NESTING BINS

SIMPLEX TOOL CO.
Woonsocket, R. I.
Kindly send descriptive circular and quote prices on your new Nesting Bin.
Name.....
Title.....
Firm.....
Address.....

tention perhaps once a year. The drive is available for lathes with from 14 in. to 36 in. swings.

Simplex and Duplex Abrasive Band and Disc Grinder

The Wall Sales Corporation, 96 Warren Street, New York, N. Y., is now marketing the Duplex-M Abrasive Band and Disc Grinder shown in the illustration. The machine is intended for use where a smooth, absolutely flat and accurate finish is required, and eliminates the necessity for filing, hand polishing, or for the use of an emery wheel or shaper for taking "skin" cuts. The machine is equipped with both band and disc abra-



Simplex and Duplex Abrasive Band and Disc Grinder.

sive surfaces, to accommodate different types of jobs, or so that the disc may be used for roughing and the band for finishing. The working surface of the band is supported by a flat bed over which it travels, band tension being automatically governed by a tension spring arrangement. A guide is provided

Make the Repair Gang Earn Dividends

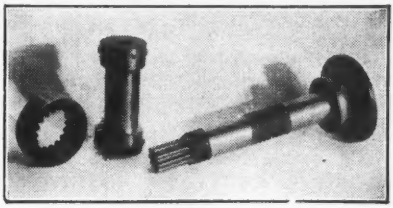
STOP making your machine tool repair men waste your profits. Stop making them spend hours to tear down a machine to get out a broken bolt or part.

KOZA RIGHT ANGLE DRILLS and GRINDERS will save that time and do it by power — not by "brute force." They eliminate the necessity of tearing down a machine to reach a broken bolt or part by drilling around the corner—at right angles.

These tools may be used for pipe and bolt threading, grinding, keywaying or countersinking. There is a tool for every requirement—in every industry.

CHAS. A. KOZA
464 Augustine St. Rochester, N. Y.

GEARS



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Whether standard or special they will measure up to your expectation.

Massachusetts Gear & Tool Co.
27 Nashua St. Woburn Mass.

LET A POWELL BLOW GUN AIR VALVE—
Blow your Turnings or Borings away

BLO-GUN

AN INTERCHANGEABLE NOZZLE TIP FOR EVERY PURPOSE—

POWELL VALVES

THE WM. POWELL CO., Cincinnati, Ohio

to aid in holding the work in position.

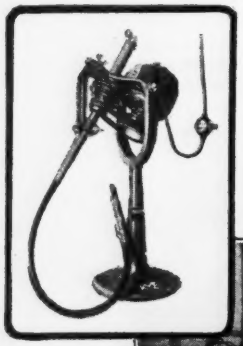
A grinding table is provided to aid in holding work against the disc. The table may be adjusted for height or to various angles, as required. The band grinding table is 5 x 10¼ in., and the disc grinding table is 2⅜ x 4¾ in. The abrasive band is 4 x 36¼ in. The disc is 12 in. diameter. The speed of the machine is 1750 r.p.m. Floor space required, 20 x 24 in. Weight, 225 lb. Motor, ½ h.p., 110 or 220 volts A.C. and 115 or 230 volts D.C.

Societe Genevoise Universal Two-Co-ordinate Measuring Machine

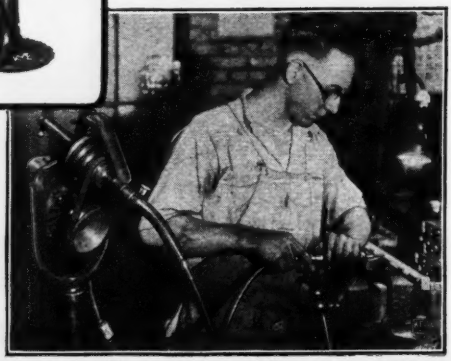
Through their American agents, The R. Y. Ferner Co., Investment Bldg., Washington, D. C., The Societe Genevoise d' Instruments de Physique of Geneva, Switzerland, is placing on the market a new type of measuring machine for general use in inspection departments of industrial plants. The machine is arranged to carry out measurements in two co-ordinates and can be used for measuring all kinds of workpieces, such as forming tools, profile gages, templets, cams, dies, and so on. Provision is also made for testing thread gages, micrometer screws, worms and taps for pitch, angle of profile and diameters by means of an optical method. Measurements may also be made of photographic negatives or charts, such as oscillograph films, X-ray pictures, spectograph plates, ballistic charts, thermographic and dilatometric tracings, and so on.

The precision of the apparatus is embodied in two accurately-graduated scales of nickel-steel alloy having the same co-efficient of expansion as ordinary steel parts. A heavy cast iron bed supports two slides which move at right angles to each other on Vee and flat ways. The longitudinal slide has a travel of 18 inches. This motion is accomplished by means of a rack and pinion, using a large hand wheel at the front of the machine, while the fine settings for readings are made by a worm wheel drive. The slide carries a 16-in. precision scale in a shielded casting at the rear of the slide.

The readings on this scale are made through a high precision micrometer microscope reading to 0.00005 in. per division. This scale is divided to twentieths of an inch throughout its length,



THE KELLERFLEX



KE

THE great assortment of Keller burs and rotary files in hundreds of different shapes, sizes and cuts, is indispensable for work on steel, bronze, aluminum, copper, rubber, horn, wood, etc.

The KELLERFLEX machine with its various speeds enables a ⅛" bur to be used as effectively as a 1" bur. This machine is ideally suited for work in the foundry for cleaning, trimming of bronze and aluminum castings, as well as finishing of patterns.

The illustration shows the BK 1 machine being used with a bur on metal pattern work.

You will be surprised to learn the many ways that this machine can reduce your operating costs throughout your entire plant.

KELLER MECHANICAL ENGINEERING CORP. 84 FRONT STREET, BROOKLYN, N. Y.
Complete Stock at Chicago and Brooklyn Offices

Speed Up
DRILLING OPERATIONS
with a

U.S. Drill Head

WITH this simple attachment on your one-hole-at-a-time drilling machine, you can drill two, six, a dozen, or fifty holes, if necessary, in the same time it takes to drill one.

The drill head shown above is a single purpose tool for drilling four holes at one time. It is a fixed spindle multiple head, but we also make adjustable spindle multiple heads, which can be used on a variety of jobs. What is your problem? We will design a U. S. Multiple Drill Head to meet your particular needs. Send us your blue print NOW.

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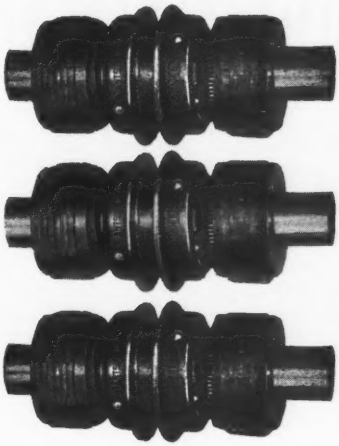

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PULLMORE
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EFFICIENT

COMPACT :: ADAPTABLE

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In addition to sending you full descriptive matter on this new and most efficient clutch, if you will send us details of any installation you may have in mind, our engineering department will be glad to submit their recommendation applying directly thereto, gratis.

Rockford Drilling Machine Co.

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Rockford Drilling Machine Co.
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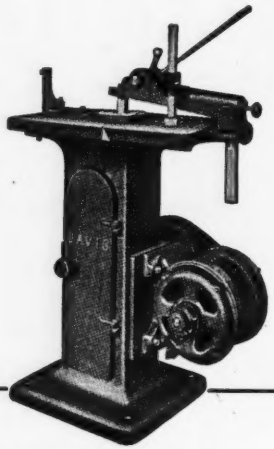
MMS-12

QUICK SET-UP does it . . .

A KEYSEATING JOB completed . . . another job to be run . . . **two minutes** to change the set-up . . . and the machine is back on productive work! That's the story of the DAVIS Keyseater.

You need such a quick set-up to cut idle machine hours in your plant. It's the non-productive time between jobs that runs up operating costs.

Let us show you how the DAVIS Keyseater reduces this wasted time to only two minutes . . . **send the coupon TODAY!**



DAVIS KEYSEATER CO.,
250 Mill St., Rochester, N. Y.

How will the Davis Keyseater reduce idle machine hours in my plant?

Name..... Title.....

Address .....

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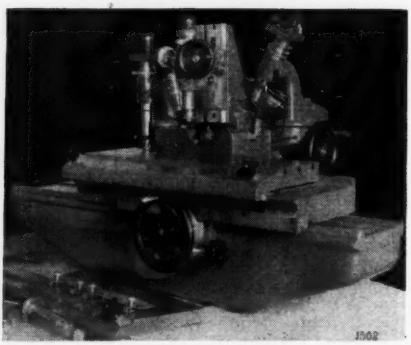
State .....

so that at least one division of the scale is in the field of view in any position of the table. A coarse scale with index is mounted on the front part of the machine bed for approximate settings.

The longitudinal slide has a 16¾ x 4⅝-in. opening to permit illumination from below. The pieces to be measured are not clamped to this slide, but to one of three interchangeable fixtures provided with the machine. One of these is a T-slotted worktable which can be clamped on the slide by means of two bolts with star handles. This cast iron table, 19¼ x 5½ in., is to be used for laying out work or for the attachment of special fixtures.

A second table that can be bolted to the slide has a strong glass plate 16½ x 3¾ in., set flush with the surface, to be used for measuring objects with illumination from below. The third fixture consists of a pair of center supports for the examination of pieces held between centers.

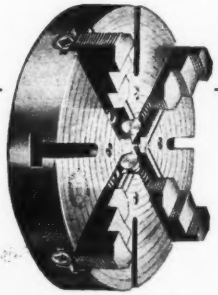


Societe Genevoise Universal Two-co-ordinate Measuring Machine.

A transverse carriage serves to carry the sighting microscopes for measurements in the other co-ordinate, the carriage carrying a precision scale on which readings are made by a second micrometer microscope. Readings on these scales are guaranteed accurate within 0.000015 in. and higher accuracy can be obtained by means of a tabulation furnished with each machine. The front part of the carriage has a vertical slide on which the toolholder can be adjusted in height by means of a rack and pinion device. A locating microscope, gonimetric microscope, punching tool, and centering dial indicator are designed to fit in this toolholder.

The locating microscope has a crossed

There's a Reason for a UNION CHUCK!



Write for a Complete Catalog

SHOP FOREMEN who know good chucks always specify UNION CHUCKS because they are modern.

Take, for instance, the chuck shown in the illustration. It is a UNION All Steel Independent Chuck No. 264. Records show that after a quarter of a century of making this chuck, *not one has broken while in service,* and besides it has oversize jaws and screws.

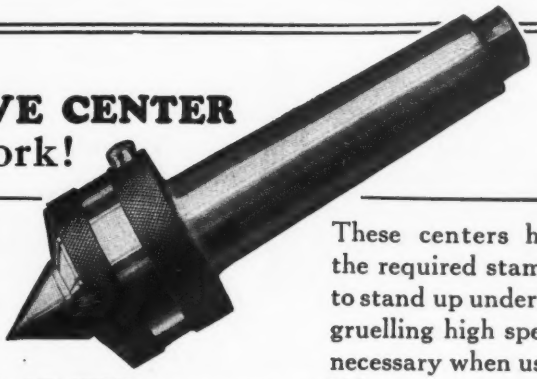
An unusual record—but only indicative of the kind of service you get from a UNION CHUCK.

UNION MANUFACTURING CO.

NEW BRITAIN *Branch Offices:* **CONNECTICUT**

27 S. Jefferson St. Chicago, Ill. | 332 Sycamore St. Cincinnati, Ohio | 26 Cortland St. New York City, N. Y. | 661 Folsom St. San Francisco, Calif.

There Is a NIELSEN LIVE CENTER For Your Work!



No matter what kind of work you have—turning or grinding—high or low speeds—light or heavy loads—a NIELSEN LIVE CENTER will give you years of dependable service.

These centers have the required stamina to stand up under the gruelling high speeds necessary when using tungsten carbide tools.

It will pay you to investigate the NIELSEN CENTER.

Write for a Bulletin!

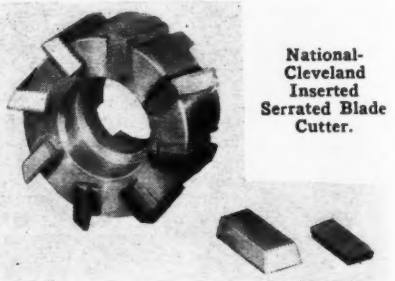
NIELSEN, INC., LAWTON, MICHIGAN

Foreign Representative: Gaston E. Marbaix, Ltd., Adelaide House, King William St., London, E.C.4

reticle of threads which can be adjusted to insure exact concentricity with the bore of the toolholder. The gonimetric microscope is provided with a fixed cross thread and one which can be turned about the central axis for measuring angles, especially on the profiles of screw threads. These angles can be read to 1 min. of arc. This microscope is also used for the optical measurement of the pitch and diameters of screw threads. The centering dial indicator, reading to 0.001 in. and sensitive to a higher accuracy, can be used for aligning work or for measuring the distance between holes. The machine may be used for the accurate checking of flat gage blocks, for checking all kinds of rules, scales on verniers, and the like, or for the measurement of diameter of wire and mesh of cement sieves, or for the counting of threads in textiles. The stretch of test specimens can also be checked with this equipment.

National-Cleveland Inserted Serrated Blade Cutters

The National Tool Company, Madison Avenue at West 112th Street, Cleveland, Ohio, has brought out a line of inserted serrated blade cutters which includes shell end mills, face milling cutters, alternate tooth cutters, straddle mills, and other cutters of special design.



National-Cleveland Inserted Serrated Blade Cutter.

Some of the advantages claimed for this design are (1) blades are locked more securely, (2) more blade adjustment, resulting in longer life, (3) quicker adjustment or replacement of blades, and (4) lower cost of maintenance.

The bodies of the cutters are made from special heat-treated alloy steel, and the blades are of high speed steel, hardened and ground. Stellite or tungsten carbide blades can be furnished on re-

RAHN-LARMON EXTENSION BED GAP LATHE

Swing 16/32", 18/36", 20/40"

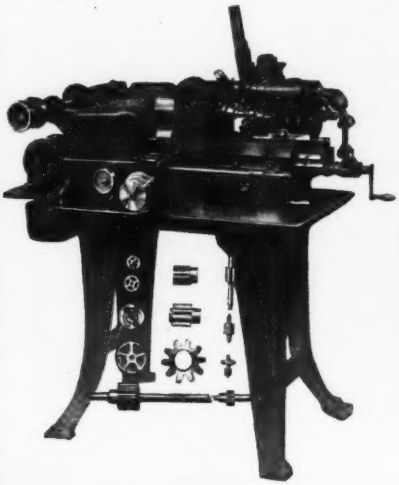
Designed for general work in all types of shops. Has ample power to turn full diameters in the gap. By sliding the top bed gap can be varied to suit the requirements of the work. With gap closed is regular engine lathe. Belt driven or all geared motor drive.

WRITE FOR CIRCULAR AND FULL INFORMATION

THE RAHN-LARMON COMPANY, 2935 Spring Grove Ave., Cincinnati, Ohio

HOB your small pinions, gears, ratchet wheels, etc.

On Our KOEPFER FULL AUTOMATIC HOBBING MACHINE



THIS machine has a fully automatic cycle of operation and on pinions is equipped with a MAGAZINE loading attachment.

The HOBBING process generates a theoretically correct tooth form and indexes the teeth uniformly accurate. It results in better work of greater PRECISION as well as greatly increased production.

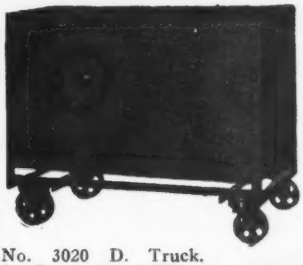
Ask for Catalog WMI

George Scherr Co.

142 LIBERTY STREET NEW YORK

STEEL TRUCKS

No. 3020-D Truck



No. 24-24-40 Truck

No. 3020 D. Truck. Load capacity 1,200 to 2,000 lbs. Heavy type casters, one end stationary, the other end revolving for easy mobility and guiding. Size 30″x20″x35″ high.

No. 24-24-40 Truck. Hand-riveted joints, heavy casters. Stationary on one end and revolving on other. Load capacity 1,500 lbs. Size 24″x40″x33″ high.

No. 218-DC Machine Tender

No. 218-DC Machine Tender. Four swivel casters, 2″ diameter. Hand-riveted joints. Rigidly braced. Size 24″x18″x35″ high. Drawer, lock equipped.

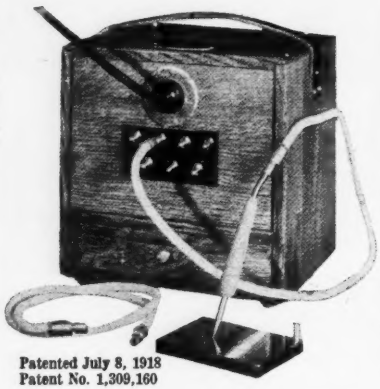
We also manufacture: Work Benches; Bench Seats; Tool Boxes; Busses; Cabinets; Chairs; Desks; Lathe and Chip Pans; Bar Storage Racks; Stools; Waste Cans; Bench Legs; Machine Tenders; Trucks, Etc., Etc.

Angle Steel Stool Company

PLAINWELL, MICHIGAN

Manufacturers of Angle Steel and Sheet Metal Equipment for Factory and Office.

Etchograph
Trade Mark



Patented July 8, 1918
Patent No. 1,309,160

For Marking Tools or Parts

NOTHING can equal the original ETCHOGRAPH. Six stages of heat—no other machine has this feature — give a wide variation in the size of marking. Simple operation—write as you would with a pencil. Just plug in on any light circuit — mark any material—iron, steel or steelite. If tool marking alone is desired, the JUNIOR ETCHOGRAPH with two heats only will do your work.

Write for quotation, stating power available.

William Brewster Company

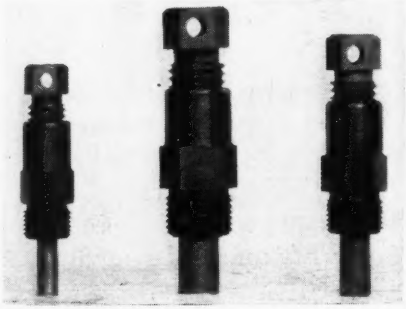
52 CHURCH STREET NEW YORK

quest. The serrations on the backs of the blades are $\frac{1}{6}$-in. pitch with 90-deg. included angle.

Shell end mills with high speed steel inserted serrated blades can be furnished in six sizes, ranging from 3 in. diameter to 6 in. diameter with general dimensions corresponding to American Standard shell end mills. Face milling cutters with high speed steel inserted serrated blades can be furnished from 6 in. to 20 in. diameter, inclusive, to fit the new National Standard spindle nose or previous standards of such machines as the Cincinnati or Milwaukee millers. These cutters are regularly furnished with $\frac{3}{8}$ in. blades. Heavy duty cutters with $\frac{1}{2}$-in. blades can be furnished to order. Alternate tooth cutters can be furnished from 4 in. to 8 in. diameter, inclusive. Straddle milling cutters can be regularly furnished from 4 in. to 8 in. diameter, inclusive. Cutters of larger diameters made on special order.

The "Grippit"

The illustration shows a new locking device that has been developed by the Wedge-Lock Tool Co., 2523 North Keeler Avenue, Chicago, Ill., and which is to be known as the "Grippit." The Grippit is made for use on drill jigs, milling fixtures, or assembly fixtures and is primarily a time-saving locking device, operating on the well-known Wedge-Lock principle. The unit is composed of four parts; the shell, plunger, spring, and operating screw. The shell is threaded with standard threads and can be located in a jig or fixture as quickly as a screw. The inside of the shell is hexagonal, to take the hexagon head of the plunger which prevents the plunger from twisting when operated.



Wedge-Lock Tool Company's "Grippit"

WHITON LATHE CHUCKS

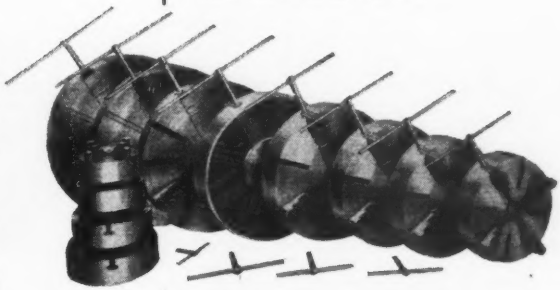
For a Sure Grip!

WHEN work must be held rigidly and securely for accurate machining at top speeds — WHITON Lathe Chucks prove their superiority!

WHITON Chucks—and there's one for every requirement—are good chucks. Their design and workmanship assure you dependable service over a long period of time.

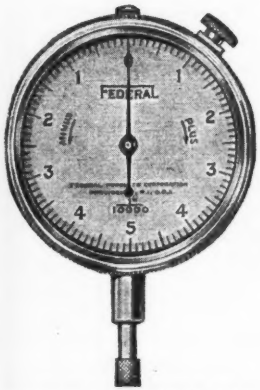
Get a WHITON Catalog—it shows the complete line of WHITON Chucks as well as many special chucks built for special requirements.

Here is a group of WHITON Steel Body Independent Chucks designed to hold heavy work under heavy cuts at high speed. The one-piece body resists sudden strain.



THE D. E. WHITON MACHINE CO.

NEW LONDON CONN.



"There is a FEDERAL Dial Gauge for every requirement"

Nothing can take the place of the FEDERAL "MILLIONWEAR"

Wide-awake executives in shops everywhere will tell you this. Experience has taught them that Dial Gauge inspection on a production basis, is not only more accurate and faster than any other method, but far more economical.

The FEDERAL "MILLIONWEAR" Dial Gauge is constructed with new type gears and pinions—far heavier than previously used in most gauges. This improvement gives the "Millionwear" the stamina to stand up under the gruelling service of all day inspection on a production basis.

Investigate Federal "Millionwear" possibilities for your shop . . . send for a bulletin!

FEDERAL PRODUCTS CORP.

PROVIDENCE, RHODE ISLAND

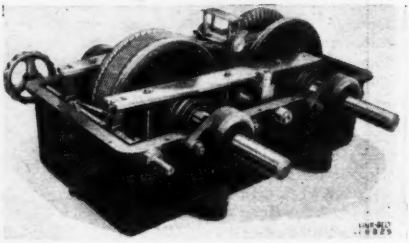
New York, N. Y.	Chicago, Ill.	Cleveland, Ohio	Detroit, Mich.
50 Church St.	549 W. Washington Blvd.	10,000 Euclid Ave.	7338 Woodward Ave.

One-eighth turn of the operating screw advances the plunger from ⅛ to $\frac{9}{16}$ inch, providing the same amount of space for loading or unloading the fixture. It has more gripping power than a screw, but, unlike a screw, the plunger does not rotate and therefore the work does not rotate. Neither will the plunger mar the work. The Grippit is made in three sizes; G-12, G-58 and G-34.

Link-Belt "P. I. V." All-Metal Variable Speed Transmission

An all-metal variable speed transmission has been placed on the market by the Link-Belt Company, Philadelphia, Penna. It is to be known by the trade name of "P. I. V. Gear," due to the fact that it affords positive, infinitely variable speed control. Basically, the unit consists of two pairs of wheels of the opposed conical disc type, between which a unique chain transmits power. The effective diameters of each pair of wheels can be altered under load to change the speed ratio, without steps and without dependence upon friction. On changing speed, the self-pitching chain rises in one set of wheels and descends in the other, so that while the input shaft (connected to a motor or other source of power) turns at constant speed, the output shaft is brought to the desired speed.

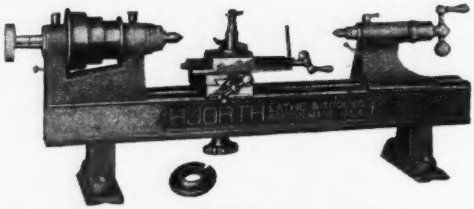
Variable speed devices employing adjustable conical discs and belts with side friction contacts have been used for some time. The wholly original feature of the P. I. V. Gear is its use of a positive chain drive to transmit the power. Radial teeth are cut in the conical faces of the driving discs, and the self-adjustable teeth projecting beyond the sides of the chain are arranged to positively engage the radial teeth of the discs.



Link-Belt P. I. V. (Positive Infinitely Variable) Gear Assembly with cover removed.

The chain used in the P. I. V. Gear is made up of a series of steel leaves or

Hjorth Precision Bench Lathe



Lathe No. 4, as illustrated, $185.00.
Countershaft $26.00. Collets (each) $3.00.

THE HJORTH Precision Bench Lathe is the product of thirty years' lathe-building experience. It is highly efficient for shops where accuracy, speed and durability are essential.

In the tool room and in the factory, for production and experimental purposes, it will handle light, medium and heavy loads with equal ease. It is never idle. There are three sizes to meet various requirements.

No. 4—Collet capacity thru $\frac{5}{8}$".
No. 5—Collet capacity thru $\frac{7}{8}$".
No. 6—Collet capacity thru $1\frac{1}{4}$".

36" bed, 18" between centers, $8\frac{3}{8}$" swing over ways.

WRITE FOR OUR CATALOG

HJORTH LATHE & TOOL COMPANY

24 SCHOOL STREET BOSTON, MASS.

CONNECTICUT BROACHES

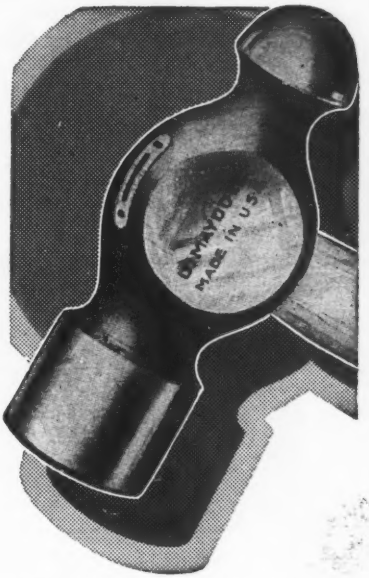
Combine Operations!

Combining operations always results in time savings and lower costs. The Connecticut combination round and spline broach obtains these results by broaching the drilled hole to size, cutting the splines, and removing the burr *in one operation*. Besides, the accuracy of the job is improved.

Investigate the possibilities of these tools in your plant. Send us a description of your job and let our engineers recommend a broach that will be guaranteed to do your job better!

The CONNECTICUT BROACH & MACHINE CO

NEW LONDON, CONN.



Balance, strength and a stubborn resistance to wear built into Maydole Hammers makes them outlast ordinary hammers for shop work.

Your dealer has the weight you like. Write us for a free copy of Pocket Handbook 23 "P" containing useful information for machinists.

YOUR HAMMER SINCE 1843

Maydole Hammers

The David Maydole Hammer Co., Norwich, N.Y.

4195

Eclipse HIGH PRODUCTION TOOLS

The Inverted Spot-Facer

The Eclipse Inverted Spot-facer is an economical tool for back facing inaccessible

This is No. 7 of a series of advertisements describing the complete line of ECLIPSE High production tools.

surfaces. The cutter is driven through two parallel keys which are integral parts of the lower end of the cutter.

These parallel keys provide a balanced drive which prevents the cutter from tipping—assuring square surfaces at all times.

This method of driving allows the cutter to be reground until it is entirely used up, as the drive is at the extreme end from cutting teeth.

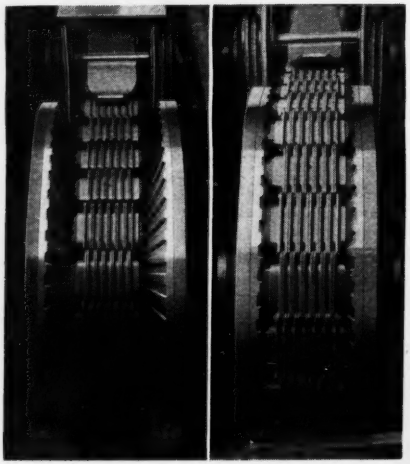
Catalog 28 describes many other advantages—send the coupon for your copy today.

ECLIPSE COUNTERBORE CO.
DETROIT MICH.

ECLIPSE COUNTERBORE CO.
Detroit, Mich.
Please send me a copy of the ECLIPSE High Production Tool Catalog.
Name.....
Firm.....
Address.....
City.....State.....

links with joints consisting of hardened steel pins turning in segmental bushings. There are no teeth on the inner surface of the chain. Instead, what might be called teeth are made up of packs of hardened steel laminations or slats which extend through slots in the links at right angles to them, and project about ⅛ in. at each side of the chain. The individual containers which hold the packs of slats are secured in the openings of the links, but, within each such container, the slats are free to slide from side to side and adjust themselves to engagement with the radial teeth of the discs over substantially the full range of diameters. The angle of the slat ends —30 deg.—is the same as that of the conical faces of the wheels.

The teeth of the discs widen from the center outward toward the circumference, but are of uniform depth, and are so staggered relatively on each pair of wheels that the slats move back and forth into the teeth to mesh correctly as the chain comes into contact with the

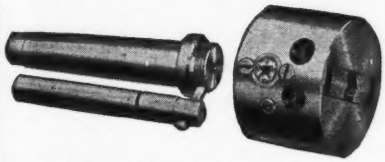


(Left)—Tooth formation of P. I. V. chain at minimum diameter of wheel. (Right)—Tooth formation at maximum diameter.

wheels. At each engagement of the chain and wheels, the slats regroup within their separate containers, but do not slide nor move under operating stress. The movement of the slats in engaging with the heels is completed before the load is applied.

All elements of the P. I. V. Gear are built into a compact, oil-tight housing, and are automatically splash lubricated.

FLYNN MICROMETER OFFSET BORING HEADS



FOR ECONOMY IN PRECISION BORING

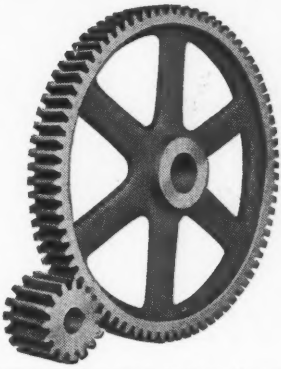
The least overhang of any head on the market, yielding utmost rigidity and maximum table travel. Made in a full range of sizes to fit all standard spindles and arbors.

Send for Circular and Price List

WATERSTON'S

420 Woodward Ave. Detroit, Mich.

GEARS



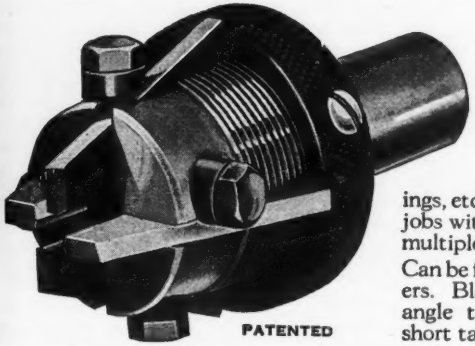
All types and sizes up to 12 ft. in diameter. Rush service for breakdowns. Also a complete line of speed reducers.

The Horsburgh & Scott Co.

5110 Hamilton Ave. Cleveland, Ohio

Genesee Adjustable Hollow Mill

Made in 7 different styles



PATENTED

Has adjustable, replaceable blades and can be replaced at nominal cost, making it unnecessary to continually buy new tools.

The ideal tool for finishing your forgings, castings, etc. Do your several operation jobs with Genesee inserted blades multiple operation tools.

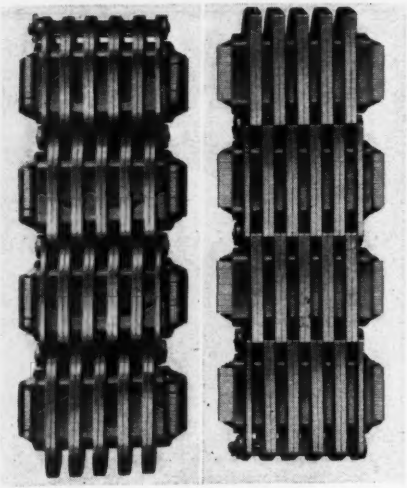
Can be fitted with drills and reamers. Blades can be ground any angle to point work and turn short tapers.

A Genesee Adjustable Hollow Mill can be made for every job

WRITE FOR CATALOGUE

GENESEE MANUFACTURING CO., Inc.

ROCHESTER, NEW YORK



Front and back views of P. I. V. chain

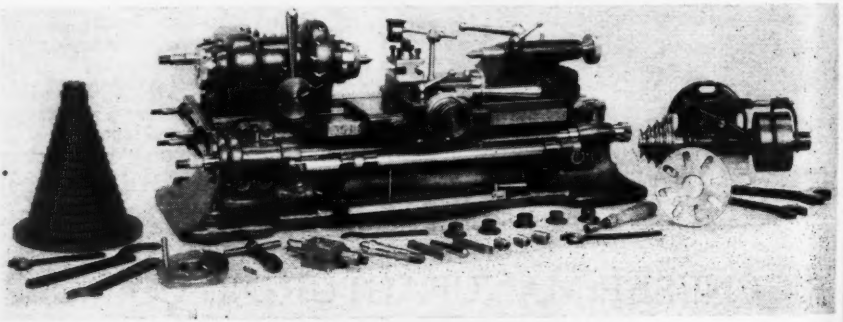
The hardened steel wheel faces are mounted on cast iron hubs backed by ball thrust bearings, and move axially on the shafts, which in turn are mounted in radial ball bearings. The movement of the wheels to increase or decrease their effective pitch diameters is controlled by a pair of pivoted levers that are operated through a hand control shaft with right- and left-hand screw motion. Provision is made for maintaining correct operating tension at all times.

The P. I. V. Gear is now available in five sizes, from 1 to 10 h.p. capacity, providing speed change ratios up to a maximum of 6:1. It has been thoroughly tested throughout the past year by continuous operation in driving machine tools, textile equipment, paper and glass-making machinery, and so on. Book No. 1274, illustrating and describing the Link-Belt P. I. V. Gear, will be sent to any mechanical executive without charge.

Societe Genevoise Precision Threading Lathe

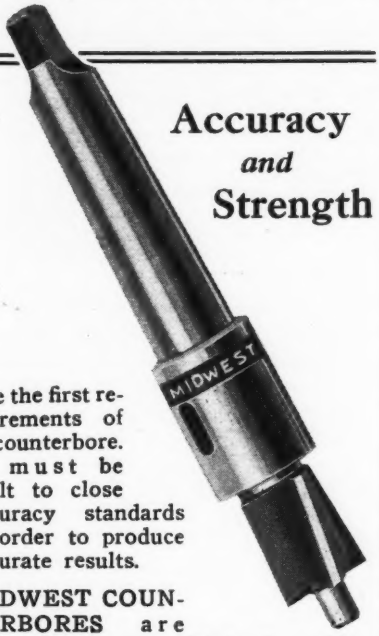
The Societe Genevoise d'Instruments de Physique, of Geneva, Switzerland, is now marketing a screw-cutting lathe which will be known as the Type PF-2A, offering it in the United States and Canada through their American agents, The R. Y. Ferner Co., Investment Bldg., Washington, D. C. This lathe has a bored spindle which permits the use of spring collets and the machining of long work as well as work which is held between centers. The lathe has a maximum distance between centers of 8⅝ in., and will cut external threads up to 2 in. diameter. The maximum diameter of work that can be handled over the ways is 6$\frac{11}{16}$ in.

The change gears supplied with the machine make it possible to obtain 36 pitches in inch units between 4.5 and 100 threads per inch, as well as 37 metric pitches from 0.1 mm. to 5.0 mm. The accuracy of the threads is guaranteed to 0.0001 in. for the whole length of range of the machine, which is 8 inches. Any minor errors in the lead screw are compensated for by the use of an arm extending from the nut to a curved slot, the curvature of which is determined from accurate measurements of the errors of the screw. The slight additional rotation or retardation of the nut at any point serves to hold the cutting tool at all times in the correct position for the



Societe Genevoise Precision Threading Lathe.

MIDWEST COUNTERBORES



Accuracy *and* Strength

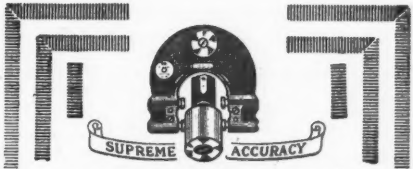
Are the first requirements of a counterbore. It must be built to close accuracy standards in order to produce accurate results.

MIDWEST COUNTERBORES are built strong to withstand sudden strains; the rigidity will overcome all vibration. Results . . . you can work to closer limits, which improves your product.

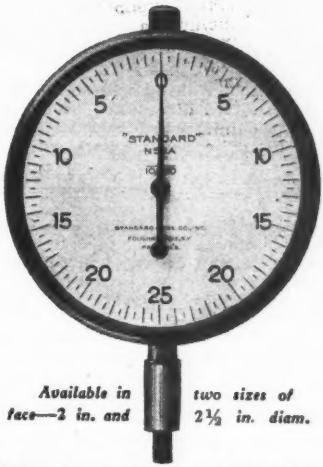
Because of the accurate work obtainable with MIDWEST COUNTERBORES, they are used exclusively in some of the largest production shops in the world.

Let us tell you more about them . . . write for a catalog.

Midwest Tool & Mfg. Co.
2362 West Jefferson Ave.
DETROIT MICHIGAN



STANDARD DIAL INDICATOR



Available in two sizes of face—2 in. and 2½ in. diam.

THIS advanced type of Dial Gage is made in a Gage making shop, to the finest of gage standards. Unit construction with the fewest number of parts, all enclosed in dust proof cover. Sturdiness that stands hardest shop. Supremely accurate because new method of cutting gears and rack makes this possible. Available in two sizes, 2-in. and 2½-in. in a full range of graduations. Write for booklet.

STANDARD GAGE CO., Inc.
Poughkeepsie, New York

The Standard Gage Co.,
Poughkeepsie, N. Y.
I would be interested in receiving copy of your catalog covering your "STANDARD" Dial Indicator.

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Address .....
City..... State.....

standard temperature of 68 deg. F. The plate carrying this slot can also be rotated about an axis to make correction for temperature so as to cut screws standard at any temperature between 32 deg. and 68 deg. F.

Spring collets of $\frac{5}{16}$ in. diameter and varying by 0.020 in. from 0.020 in. to 0.050 in. are supplied as standard equipment, and special collets can be furnished upon request. Other equipment includes a toolholder for internal threading, a driving plate for external threading, a bored draw-in bar, a set of female centers, a magnifying lens with support, and two sharpened cutting tools of 60 deg. and 55 deg. angle.

The toolholder is adjustable in lateral and longitudinal directions, and is operated by two micrometer screws, reading to .0004 in. The cutting tool can be disengaged at the end of the cut and brought back to starting position without varying the adjustment of the screw that determines the depth of the cut, thus saving time. The tailstock is adjustable to allow for perfect alignment. The headstock is fitted with a clutch and reversing gear. An automatic stop disengages the clutch at the extreme end of travel of the tool, precluding the possibility of damage through inattention of the operator.

The overall length of the lathe is 31½ in.; width, 15⅛ in.; height, 13⅜ in., and the height of the spindle over the bed is 9⅝ inches. The lathe is driven through a 4-pulley countershaft and a $\frac{1}{16}$ in. round belt to the driving pulleys of the lathe, providing four speeds of 26, 46, 78, and 140 r.p.m. The return speeds are three times as fast.

National Tool Company Offers Interesting Shop Calendar

New inventions, new machinery have greatly changed the trend of machine shop practice of today over methods which were followed years ago. One thing, however, remains the same and that is — the human element. Every "old timer" can look back over his early machine shop days and recall many humorous incidents which made his tasks less difficult—the days shorter. Just such a fellow is the nationally-known cartoonist who prepared twelve original cartoons for The National Tool Company's 1931 Calendar. With a background of years "at the bench," the rare humor of his drawings is keenly enjoyed by "every old-timer."

The calendar consists of twelve large sheets, each sheet of which features an original reproduction by this famous cartoonist, along with a calendar of the current month with figures large enough to be seen from a considerable distance and with preceding and subsequent months on the same sheet, set somewhat smaller, for reference purposes. This type of calendar has been distributed by The National Tool Company for the past two years during which time its popularity has become increasingly great. This year plans have been made for several thousand copies of this calendar in excess of their present requests. Machine shop executives can have a copy of this

calendar without charge by addressing National Tool Co., Madison Avenue at West 112th Street, Cleveland, Ohio, using their firm letterhead.

Fixtures For Offset Milling

(*Continued from page* 44)

forces the moveable jaw into position to hold the work.

An offset milling fixture for milling the faces of articulator rods for airplane motors is shown in Fig. 6. The

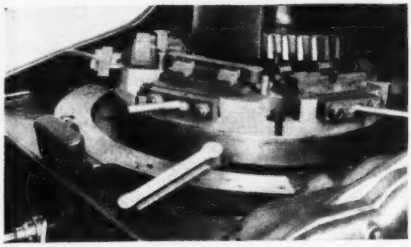
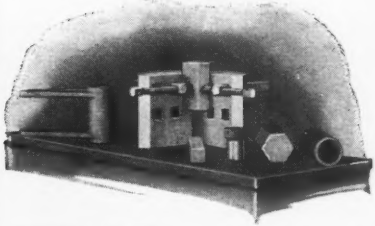


Fig. 6—Fixture for use in face-milling articulator rods for airplane motors.

rods are locked in position by hand-operated cam-action levers, each lever forcing a moveable jaw, together with the work, into position against a stationary jaw. The lever moves in a horizontal plane.

SQUAR-IT
CLAMPING BLOCKS
Small Size, 2⅛" Capacity
Large Size, 4½" Capacity



HUNDREDS OF THESE NEW FIXTURES NOW IN USE THROUGHOUT THE UNITED STATES

THIS block will hold various shapes and eliminate many special jigs. It can be used to advantage on the shaper, grinder, lathe, milling machine, engraving machine and for quick squaring and clamping, laying out work, etc.

Write for descriptive circular and prices

HOMER STRONG & CO., INC.
ROCHESTER, N. Y.

BRADFORD *now offers*

HYDRAULIC FEED Drilling Machines for HEAVY DUTY Drilling

Maximum capacity, 30,000 pounds.
CAM feed unit type drill heads, 3-inch and 6-inch stroke with single or multiple spindles.
Single and multiple spindle tapping heads.
Consult our drilling and tapping specialists.
Send us your blue prints today.

The Bradford Machine Tool Company
CINCINNATI, OHIO *ESTABLISHED 1840*

Check For Information Wanted

If you are interested in prices or information on any of the equipment listed, check the item, write your name, firm name, title and address on the margin, tear out the page and send it to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. We will see that you are supplied with the information desired.

- ☐ Abrasive Discs
- ☐ Abrasive Polishing Grains
- ☐ Arbors
- ☐ Babbitt Metal
- ☐ Balancing Machines
- ☐ Balancing Ways
- ☐ Bearings, Ball or Roller
- ☐ Bearings, Die-cast
- ☐ Bearings, Bronze & Bab't
- ☐ Belting, Leather
- ☐ Belt Dressing
- ☐ Bench Legs
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- ☐ Bending Machines
- ☐ Blue Printing Machinery
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- ☐ Boring Tools
- ☐ Broaches
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- ☐ Chucks, Collet
- ☐ Chucks, Drill and Tap
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- ☐ Sawing Machines, Power
- ☐ Saws, Band
- ☐ Saws, Milling
- ☐ Scales, Machinists'
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- ☐ Screw Machines, Hand
- ☐ Screws, Cap, Set or Mach.
- ☐ Screws, Hardened Drive
- ☐ Screws, Self-Tapping
- ☐ Shafting
- ☐ Shafts, Flexible
- ☐ Shapers
- ☐ Shears, Hand or Power
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- ☐ Tapping Attachments
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- ☐ Testing Mach'y, Hardness
- ☐ Thread-Cutting Tools
- ☐ Threading Machines
- ☐ Thread Mill. & Roll. Mach'y
- ☐ Tool Bits
- ☐ Tool Cases
- ☐ Tool Holders
- ☐ Tool Posts, Lathe
- ☐ Trolleys and Tramways
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- ☐ Turrets, Tool Post
- ☐ Valves, Air Control
- ☐ Vises, Bench or Machine
- ☐ Welding Equip. & Supplies
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- ☐ Wrenches, Drop-Forged
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- ☐ Wrenches, Ratchet
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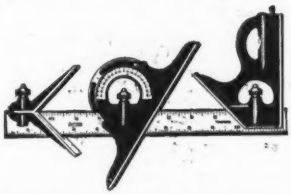
TOOLS



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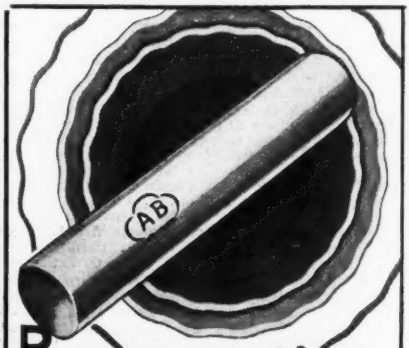

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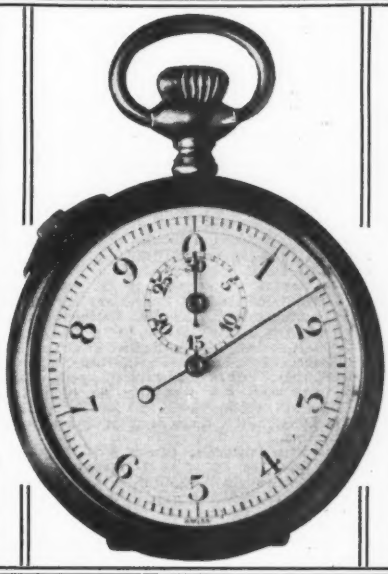

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Pointers on Internal Grinding: A folder containing data on the selection of internal grinding spindles, selection of grinding wheels, methods of holding work, grinding bushings, grinding holes with keyways or slots, and other useful information will be sent free to any machine shop executive. Address Abrasive Company, Tacony and Fraley Streets, Philadelphia, Penna.

Broaching By Modern Methods: Equipment and tools for finishing round, square or irregular-shaped holes and surfaces by broaching are described and illustrated in a booklet that is issued free by the American Broach & Machine Co., Ann Arbor, Michigan.

Ames Dial Gages: The latest types of dial gages for inspection purposes are described in the Ames No. 55 Bulletin, which will be sent free to any machine shop executive. Address B. C. Ames Co., Waltham, Mass.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angle Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Hold Odd-Shaped Pieces Securely: A vise in which odd-shaped work can be held securely without the need of special jaws or fixtures is described in a folder that has been issued by The Avey Drilling Machine Co., P. O. Box 487. Cincinnati, Ohio. Copy free upon request.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-oiling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

Boker Keyless Chuck: A chuck that is built of three units, grips like a vise, and needs no key is described in a pamphlet that can be obtained by addressing H. Boker Co., Inc., 103 Duane St., New York, N. Y.

"C-V" Chrome Vanadium Wrenches: A complete line of wrenches made of Chrome Vanadium steel—practically unbreakable—is described in a booklet that has been issued by the Bonney Forge & Tool Works, Allentown, Pa. Copy free upon request.

Bradford Precision Lathes: Precision Lathes for the tool room and for general manufacturing purposes, all-geared and cone types, belt or motor driven, are described and illustrated in a catalog that is issued by The Bradford Machine Tool Co., 657-671 Evans St., Cincinnati, Ohio. The catalog also includes descriptions of taper, relieving, turret and other lathe attachments. Sent free upon request.

Mark Tools or Parts: Metals are easily marked by the Etchograph—an electrical unit that can be used with any light circuit. For particulars address William Brewster Company, 52 Church St., New York, N. Y.

Reduce Costs By Face-Grinding: Stock on flat surfaces can be removed at high speed and low cost by grinding on a hydraulically-operated face-grinding machine. Write for bulletin to The Bridgeport Safety Emery Wheel Co., Inc., 1264 W. Broad Street, Bridgeport, Conn.

How To Sharpen Staggered Tooth Cutters, Helical Milling Cutters, and Two-Lipped End Mills: A series of pamphlets on these subjects can be obtained without charge by addressing the Brown & Sharpe Mfg. Co., Providence, R. I.

Gears Of All Kinds are described and illustrated, with specifications, in Catalog 90, which has been issued by the Chicago Gear Works, 105-9 S. Jefferson St., Chicago, Ill.

Grinding the Centerless Way: The advantages of the centerless grinding method is discussed in a booklet which also describes the centerless grinding machines made by Cincinnati Grinders, Inc., Cincinnati, Ohio. The illustrations show various types of jobs in process, and full data is included. Copy free upon request.

Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Bolender Gear Burnishers: Gears will operate more smoothly and more silently if burnished. Full description of the Bolender Gear Burnisher can be had by addressing the City Machine & Tool Works, Third and June Sts., Dayton, Ohio.

Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

Columbia Superior Shapers: Bulletin No. 17, issued by The Columbia Machine Tool Co., Hamilton, Ohio, describes and illustrates the line of heavy duty shapers made by this firm. Copy free upon request.

Columbia Tool Steel Handbook: A book containing valuable information concerning the making of tools, heat treating, uses of hardness testing instruments, uses of the quenching bath, drawing bath, and other heat treating equipment, and together with tables and other useful information can be obtained without charge by addressing the Columbia Tool Steel Co., 550 E. 14th St., Chicago Heights, Ill.

Table of Hardness Scales giving in parallel columns corresponding figures in Rockwell, Shore and Brinell, with table of size and capacity of broaches made by the Connecticut Broach & Machine Co., New London, Conn., on obverse side, can be had by addressing this company. Particularly useful in heat treat department. Without charge.

Motorize Your Cone Pulley Lathes: An attachment that can be applied to your lathe with four bolts makes it possible to motorize and modernize your lathes. Write for information to Cullman Wheel Co., 1336 Altgeld St., Chicago, Ill.

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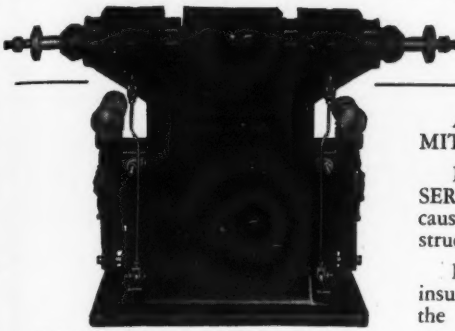

is what you want!

This is the No. 7 MITCHELL Motor driven double spindle polishing lathe. It is equipped with two individually controlled motors, push-button starters, motor air cleaners, foot brakes and "V" belt drives.

And, SERVICE is what you get from a MITCHELL Polishing Lathe!

But you have a right to expect dependable SERVICE from a MITCHELL Machine, because it is carefully designed and sturdily constructed to stand up under the hardest usage.

Its design incorporates many features which insure a long life. Some of these features are: the well known MITCHELL unit assembly; new type flat covers which afford convenient places to lay tools, etc.; foot brakes; "V" belt drive and many others. The MITCHELL catalog describes all these features—write for a copy.

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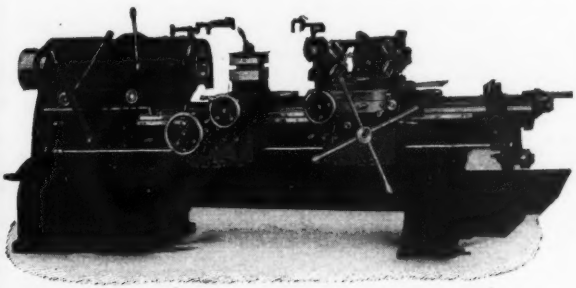
No. 3 Acme Heavy Type Universal Turret Lathe with DUO CONTROL

Higher operating efficiency, together with simplified design, makes this Acme Turret Lathe an unequalled producer on all work within range.



DUO CONTROL Turret Lathes Built in These Sizes

No. 1 — Semi- and Full Universal, 2½" capacity.

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17" and 4½" Semi- and Full Universal, 4½" spindle capacity.

THE ACME MACHINE TOOL CO., Cincinnati, Ohio

Die Makers' Supplies: A complete line of die sets, leader pins, bushings, and other die makers' supplies are described in a book that is issued by the Danly Machine Specialties, Inc., 2104 South 52nd Avenue, Chicago, Ill. Sent free upon request.

Davis Keyseaters: Recent developments in keyseating methods are discussed in a bulletin that also describes the keyseaters made by the Davis Keyseater Company, 250 Mill St., Rochester, N. Y. Copy free upon request.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Precision Grinding: A booklet which describes and illustrates the most modern methods of performing all kinds of precision grinding operations, showing how the Dumore grinder can be applied to various kinds of machine tools, has been published by The Dumore Company, Racine, Wis. Copy free upon request.

Interchangeable High Production Tools: Catalog No. 28, issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Grooved Cast Iron Pulleys: All sizes of grooved cast iron pulleys, made by Efficient Machine Shop, 147 Baxter St., New York City, are listed in a circular that can be had by writing this firm.

Lathe Turrets of eight different types and twelve sizes are described and illustrated in Circular No. 18, issued by Fay & Scott, Dexter, Maine. Copies free upon request.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

The Involute Gear Simply Explained: A direct, clear explanation of the theory and principles of involute gearing without the use of higher mathematics can be obtained without charge by addressing The Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Questions To Ask Before Buying a Jig-Boring Machine: A list of the fine points to look for in a jig-boring machine, with descriptions and illustrations of the working parts of the Swiss Jig Borer, can be obtained free by addressing The R. Y. Ferner Co., 1511 K St., N. W., Washington, D. C.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Fosdick Drills: This publication gives details as to the design and construction of Fosdick Radial, Upright, and Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

Modern Grinding Equipment: The complete line of universal tool and cutter grinders, surface grinders, drill grinders, tap grinders, and other grinding machines made by the Gallmeyer & Livingston Co., 336 Straight St., S. W., Grand Rapids, Michigan, is described in a series of bulletins that have been issued by this firm. Free upon request.

Adjustable Blade Cutters: Hollow mills, facing tools, face mills, milling cutters and other production tools with adjustable, interchangeable blades are described and illustrated in a booklet that is issued free by the Genesee Manufacturing Co., 141 N. Water St., Rochester, N. Y.

Take Care of Your Tools by keeping them in a convenient, strong, and fine-looking chest. A catalog of tool chests, complete with descriptions and illustrations, can be had by addressing H. Gerstner & Sons, 1283 Columbia Street, Dayton, Ohio.

Machine Vises of all sizes for use with machine shop equipment are described in a circular that will be sent free upon application to The Graham Mfg. Co., 69 Willard Ave., Providence, R. I.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Swiss Files: The complete line of Grobet Swiss Files for use in die and tool work or for other fine work is described and illustrated in Catalog "K," published by the Grobet File Corporation of America, 3 Park Place, New York, N. Y. Copy free upon request.

Drawing Tables: The Hamilton steel-base, adjustable drawing table is described in Catalog No. 7-MS, issued by the Hamilton Mfg. Co., Two Rivers, Wis. Copy free upon request.

Texdrive Grinders for Vitrified or High Speed Wheels: A six-page bulletin No. 43 describes in detail and illustrates the advantages of the new Hisey Texdrive Grinder —stressing especially the multi-speed and single-speed machines. Write for a copy to The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, O.

Precision Bench Lathe Work can only be done on finely-built, accurate machines. The complete line of Hjorth Precision Bench Lathes is described and illustrated in a catalog that has been issued by Hjorth Lathe & Tool Company, 24 School Street, Boston, Mass. Copy free upon request.

Speed Reducers: A catalog of speed reducers up to 200 h.p. and built to deliver any ratio desired in standard size units can be obtained by addressing The Horsburgh & Scott Co., 5110 Hamilton Ave., Cleveland, Ohio. Give firm name.

Make Time Studies: Full equipment for making time studies, including stop watches, time study observer's boards, and observer's time study forms, are described in a booklet that will be sent without charge. Address Thos. R. Hough Associates, 5337 Belle Plaine Ave., Chicago, Ill.

Tool Room Equipment: Jig borers, vertical shapers, die relieving lathes, tool milling machines, button die grinding machines, and other tool room equipment are described in a catalog issued by the Index Machinery Corporation, 49 Central Ave., Cincinnati, O. Copy free upon request.

Special Mil-Waukee-Mils of Standard Units: A milling machine of which the base, heads, columns, and other parts are built in standard units, thus enabling the user to order a machine that will be especially adapted for his job, is described and illustrated in Catalog No. 36, issued by the Kearney & Trecker Corporation, Milwaukee, Wis. Free to machine shop executives.

Keller Automatic Toolroom Machine for machining dies, metal patterns, jigs, core boxes, molds, and other irregular parts is fully described in a booklet that can be had free by addressing the Keller Mechanical Engineering Corp., 84 Front Street, Brooklyn, N. Y.

Koebel-Wagner Diamonds for Wheel Dressing: The Koebel-Wagner method of mounting diamonds and the use of the "Dykon" gage are discussed in a bulletin issued by the Koebel-Wagner Corporation, 144 Orange St., Newark, N. J. Free upon request.

Drill Around Corners: Holes can be drilled in close quarters by the use of the Koza Right Angle Drill. Can also be used for keywaying or countersinking. A descriptive pamphlet can be had by addressing Chas. A. Koza, 464 Augustine St., Rochester, N. Y.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Punching and Shearing Machines of the most modern design are described and illustrated in a series of bulletins that can be obtained without charge by addressing The Long & Allstatter Co., Hamilton, Ohio.

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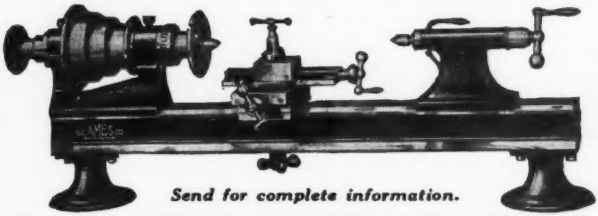

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Bench Lathes

For Turning—Drilling
Grinding—Milling—
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room or in production.

Send for complete information.

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BROACH *for* *Accuracy—Economy!*

Let us show you how to finish more holes—more accurately—and at less cost.

The American 2-Ton Hydraulic Press

is recommended for broaching connecting rods and work that comes within the 2-ton range. We manufacture presses from 2 tons to 150 tons pressure, also all types of broaching tools.

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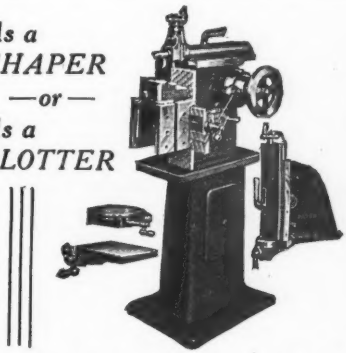

USED either way, you can't beat the RHODES "Convertible" Shaper and Slotter when it comes to accuracy, speed and economy!

This tool provides an ideal means of handling a wide range of work ordinarily assigned to larger machines. Easily and quickly changed from one tool to the other it is a space saver in any shop. Send for a Bulletin.

THE RHODES MFG. CO.
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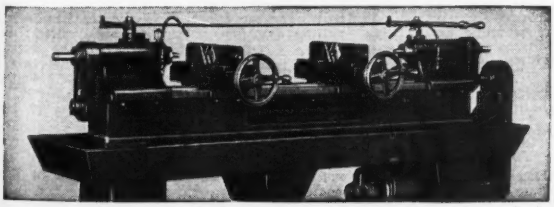

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Double End Centering Machine

For centering both ends of a shaft simultaneously. Spindles operate together or independently. L. H. head is removable for long shafts. Accommodates a wide variety of work. Special fixtures furnished when desired. Send for Bulletin.

SUNDSTRAND MACHINE TOOL CO. **Rockford, Illinois**

Rapid-Reading Micrometer: A new type of rapid-reading micrometer, designed to show the reading in numerals, is described in Catalog No. 5, issued by The Lufkin Rule Co., Saginaw, Michigan. The catalog also contains descriptions of the micrometers, calipers, gauges, scales, squares, bevel protractors, and other tools made by this company. Free upon request.

Gears: Quick service on gears in either standard or special sizes is available from the Massachusetts Gear & Tool Co., 27 Nashau St., Woburn, Mass. Particulars upon request.

"A Captain of Industry:" Pocket Handbook 23-P, issued by The David Maydole Hammer Co., Norwich, N. Y., tells how David Maydole came to make what he considered the best hammer in the world, and also includes descriptions of the various types of Maydole hammers. Several useful tables are included. Copy free upon request.

Time Saving Machine Equipment: How machining time can be reduced to the minimum by the use of Wizard chucks, collets and tap holders, turret tool posts, self-centering steadyrests, and other McCrosky equipment is told in a book that is issued by the McCrosky Tool Corporation, Meadville, Penna. Will be sent without charge.

Midwest Pin Drive Keyway Cutters are described and illustrated in a catalog that can be had by addressing Midwest Tool & Mfg. Co., 2362 West Jefferson Ave., Detroit, Michigan.

Polish at Any Speed: The Mitchell motor-driven polishing lathe, in which herringbone gears are used to transmit power from the motor shaft to the lathe spindle, can be operated at any desired speed. Bulletin can be obtained by addressing the Mitchell Engineering Co., Springfield, Ohio.

Compound Spot-Facing Tool: A spot-facing tool retracting, serrated roughing cutters and fixed finishing cutters in the same tool will break up the scale easily and do accurate work. Write for bulletin to Mummert-Dixon Co., 120 Philadelphia St., Hanover, Penna.

Nates Drilling, Tapping, and Boring Equipment is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Nates" multiple drilling and tapping machines.

"The Answer to Your Gear Problems": Information as to correct methods of cutting and finishing gears will be supplied without charge by The National Tool Co., Cleveland, Ohio. This firm also carries a complete stock of gear shaper cutters and markets the National-Cleveland Spur and Helical Gear Grinding Machine.

Save Time with Expanding Mandrels: How expanding mandrels will solve the problem of turning pieces with odd-size holes, and will increase production on duplicate work, is told in a folder that will be sent free upon request by W. H. Nicholson & Son, 136 Oregon St., Wilkes-Barre, Pa.

Live Centers: The complete line of live centers manufactured by Nielsen, Inc., of Lawton, Mich., are fully described in a bulletin issued by this company. This bulletin is illustrated with photographs and blueprints of the Nielsen Center. Mailed free upon request.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

How To Grind Cemented Tungsten Carbide: A booklet which describes and illustrates the correct methods of grinding tungsten carbide tools has been published by the Norton Company, Worcester, Mass. Copy free upon request.

Die Making Machines: How dies, templates, gages, etc., can be sawed out, filed, and lapped easily and accurately on Oliver die making machines is fully described in a bulletin issued by the Oliver Instrument Company, 1430 Maumee Street, Adrian, Mich. Mailed upon request.

Self-Tapping Sheet Metal Screws: Screws which are threaded and hardened in such a manner as to enable them to cut their own threads as they are screwed into sheet metal assemblies are described in a folder which is published by the Parker-Kalon Corporation, 192-196 Varick St., New York City, N. Y. Sent free upon request.

Use the Right Tool Steel for the Job: Full information as to the difference in tool steels and the correct grade of steel for each purpose is contained in a folder that has been issued by Poldi Steel Corp. of America, 245-247 West 18th Street, New York. Copy free upon request.

Powell "Blo-Gun" Air Valves: Air is faster and more efficient than a brush for cleaning machine tables. The use of the Powell Blo-Gun for this purpose is discussed in a catalog that can be obtained by addressing The Wm. Powell Co., Cincinnati, O.

Tapping Devices, Quick-Change Chucks, Stud-Setting Tools and Bench Tappers: A catalog describing the various types and kinds of tapping, drilling, and stud-setting devices manufactured by the Procunier Safety Chuck Company, 12 South Clinton Street, Chicago, Ill., can be obtained without charge by addressing this company. The catalog also tells the part that Procunier tools play in obtaining greater accuracy and less tap breakage.

Engine, Turret, and Gap Lathes are described in a series of bulletins that have been issued by The Rahn-Larmon Co., 2935 Spring Grove Ave., Cincinnati, Ohio.

Shape or Slot With This Machine: The Rhodes Convertible Shaper, made by The Rhodes Manfg. Co., Waltham, Mass., can be used for horizontal shaping or vertical slotting. Details upon request.

Fullmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Hy-Draulic Shaper-Planer: The most modern features are embodied in the design of the Rockford Hy-Draulic Shaper-Planer, which is intended for work that would otherwise go to the small planer or large shaper. Write for folder to Rockford Machine Tool Co., 2414 Kishwaukee Ave., Rockford, Ill.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Full Automatic Hobbing: Small pinions, gears, ratchet wheels, and similar parts can be hobbed economically on a full automatic hobber with magazine attachment. For full details write the George Scherr Company, 142 Liberty St., New York, N. Y.

Stamp Your Name on Your Product: Full information as to the steel roller dies made by The Schwerdtle Stamp Co., 10 Cannon Street, Bridgeport, Conn., can be obtained by writing this firm.

Saving Time With Small Tools: A line of time-saving small tools, including "Use-'Em-Up" drill sleeve, "Wear-ever" chucks, collets, cutters, reamers and tap holders, counterbores, spotfacers, and other tools is described in Catalog 36, issued by Scully-Jones & Co., 1909 S. Rockwell St., Chicago, Ill.

Equipment For the Shop: Vises for the bench, drill press, milling machine or shaper; angle plates; adjustable clamps, jacks and other tools for the machine shop, are described and illustrated in a booklet that is published by the Sheldon Machine Co., 3253-55 Cottage Grove Ave., Chicago, Ill. Copy free upon request.

Economies in Material Handling: A volume of facts about planned load handling, with actual examples of economies in time, material, and labor costs that have been effected with Shepard electric hoists will be sent free upon request to Shepard Niles Crane & Hoist Corp., 424 Schuyler Ave., Montour Falls, N. Y.

Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and

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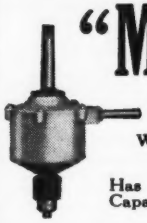

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The NEW "PROCUNIER" HIGH SPEED TAPPER

WITH "DOUBLE-CONE" CORK CLUTCH AND AUTOMATIC REVERSE

For High Speed Sensitive Tapping On Drill Presses

Has Ball Thrust Bearings, Balanced Reverse, Bronze Bushings. Capacity, ½" Cast Iron, 7/16" Steel. Price only---------- $45.00

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Capable Operators or Modern Machines

Neither can produce good grinding with dull or glazed wheels. Grinding wheels must be sharp! The Desmond Ball-Bearing Dresser is a practical substitute in many cases, for Diamond Dressers. It is designed for precision work.

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URBANA, OHIO

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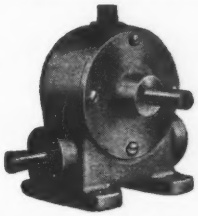
Speed Reducers

1/16 to 5 H. P. Capacity. Ratios of reduction 5-1 to 2500-1



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New Catalog No. 25 Sent Upon Request

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A good one for your Driller, Miller, Shaper or Planer.

VISE

Jaws 6", 9" and 12" Long V-Jaws, extra, for All

With and Without Jig Attachments

Any vise will pay. More time is consumed in catching work than drilling it.

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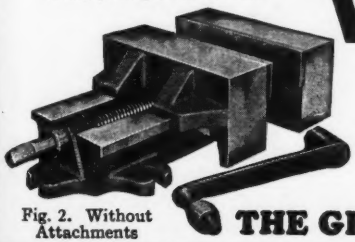

Fig. 2. Without Attachments

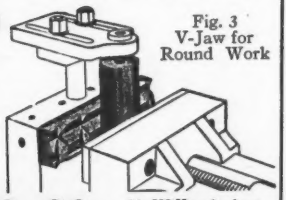

Fig. 3 V-Jaw for Round Work

THE GRAHAM MFG. CO., 69 Willard Ave. Providence, R.I.

cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

Simplex Nesting Bins: Bins which may be used as individual containers, as tote-boxes, or "nested" to form stock-room sections are described in an illustrated circular published by the Simplex Tool Co., Woonsocket, R. I. Copy free upon request.

The Most Efficient Speed for the operation of special by the use of the WHS Speed Reducer and how it can production units, power conveyors, and other machinery be obtained is told in a bulletin that will be mailed free by Winfield H. Smith, Inc., 30 Eaton St., Springville, N. Y.

A Snyder Tool Set-Up, consisting of a Snyder ball-bearing multiple head, bushing plate, and work holding fixture, will convert a single spindle drill into a multiple drill at small cost. Particulars upon request. Address Snyder Tool & Eng. Co., 3400 E. Lafayette Ave., Detroit, Michigan.

Accurate Gages Speed Production: The complete line of snap, plug, ring, pin, dial indicator, and special gages made by the Standard Gage Co., Inc., Poughkeepsie, N. Y., is described and illustrated in Catalog No. 4, which can be had without charge by addressing this firm. Johansson gage block sets and accessories are also listed in this book.

Machinists' Tools and Gages: Catalog No. 24, issued by the L. S. Starrett Co., Athol, Mass., describes and illustrates the complete assortment of machinists' fine tools and gages made by this firm. Copy free upon request.

"Squar-It" Clamping Blocks will hold odd shapes and eliminate necessity for special jigs. Can be used on any machine. Write to Homer Strong & Co., Inc., Rochester, N. Y., for descriptive circular.

Rigidmilling Principles and Practice: A book that shows how the Rigidmil can be adapted to various kinds of usual and unusual milling operations, and which describes in detail the work that can be handled by this machine has been issued by the Sundstrand Machine Tool Co., Rockford, Ill. Copy free upon request.

Cutting and Grinding Facts: A discussion of cutting oils and lubricants, together with descriptions and illustrations of various kinds of jobs upon which cutting oils are used, is contained in a booklet that is issued by the Sun Oil Company, Finance Building, Pittsburgh, Pa. Free upon request.

Save Cutting Oil: How cutting oil can be separated from chips and thus reclaimed by the use of a centrifugal chip **"wringer," is told in a bulletin that is issued free** by the Tolhurst Machine Works, Troy, N. Y.

Chuck With Air: How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tomkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

A Simplified and Improved Drive Control for Machinery: Two distinct types of plate clutches that have proved successful highly in the driving mechanism of machine tools are described and illustrated in a bulletin that will be sent free by the Twin Disc Clutch Company, Racine, Wis.

Powerful, Easy-Acting Chain Hoists of the most modern design are described and illustrated in a booklet that is issued by the Union Manufacturing Co., 298 Church St., New Britain, Conn. Copy free upon request.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 24, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

Measuring Threads by Wires: Directions for micrometer gaging of screw threads by the use of wires are given in Circular W26, published by The Van Keuren Co., Watertown, Mass. Copies may be obtained free by addressing this company.

Tool Chests for Machinists and Toolmakers: The complete line of fine tool chests for machinists and toolmakers made by J. M. Waterston, 420 Woodward Ave., Detroit, Mich., is described in Catalog No. 25. Ask for it.

Screw Machine Products: Full information as to the manufacturing service on screw machine products maintained by Western Screw Products Co., 19-31 St. George St., St. Louis, Mo., will be sent upon request.

Wetmore Adjustable Reamers: The exclusive features of the Wetmore Adjustable Shell Reamer are discussed in Catalog No. 29, issued by the Wetmore Reamer Co., 62 27th St., Milwaukee, Wis. Copy free upon request.

Whiton Steel Body Lathe Chucks: The various types and sizes of steel body chucks for lathes that are made by the D. E. Whiton Machine Co., New London, Conn., are described and illustrated in a booklet that will be sent free upon application to this firm.

"An Inspection Tour of Industrial Plants" is a booklet published by Wilson-Maeulen Co., Inc., Concord Ave. & 143rd St., New York, N. Y., showing the heat-treating equipment in use in a number of industrial plants, and discussing the manner in which such equipment is automatically controlled. Copy free upon request.

OTHER PUBLICATIONS LISTED ON PAGES 104, 106 and 108.

Thread Measuring Wires

Made to Bureau of Standards Specifications. We have over 250 sizes of measuring wires and reversible plug gages in stock. Circular W26 gives full data on measuring wires and their uses. How many copies do you want?

Have you Catalog No. 28, showing Light Waves, Gage Blocks, Plug gages, Micrometer laps?

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Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blue prints and inquiries.

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CHAMFERING MACHINES - BURNISHING MACHINES - GRINDING CHUCKS - SPECIAL MACHINES

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Designers and Manufacturers, Machine Tools and General Toolroom Products

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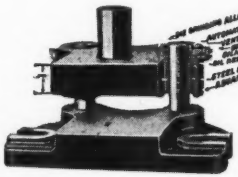
DIE SETS



Standardized die sets, embodying many exclusive features, and a listing of 70,000 stock sizes afford a service that is unsurpassed.

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100 Special Cutters a Day

THAT'S the record the Oliver Die Making Machine is making in a big production plant. The cutters are accurate—*must pass rigid inspection.* It will pay you to investigate this versatile machine that saves from 30 per cent to 50 per cent on practically any sawing, filing or lapping operation.

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THE choice of particular men for 25 years. Now better, finer and more desirable than ever.

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Come to Headquarters for

Grooved (*Cast Iron*) **Pulleys**

All Size Holes

Pulley Diam. inches	Size of Holes inches			
2½	¾	½	⅝	
3	½	⅝		
4L	⅜	½		
4	½	⅝	¾	1
5	½	⅝	¾	1
6	½	⅝	¾	1
8	½	⅝	¾	1
10	½	⅝	¾	1
12	½	⅝	¾	1

Special Holes Bored

Mfd. By **EFFICIENT MACHINE SHOP** 147 Baxter St. New York City

THE SCRAP PILE

By Geo. Alexander Mann

Hush

He's sure an odd geek,
Couldn't be odder;
They all call him "Horse"—
Takes after his fodder.

Mos' any ol' doc will tell you that you can prolong life if you'll give up everything that makes it worth while.

They Do Take Chances In Chi

Ad in Chicago paper—"Widower with five children would like to meet a widow with four—object baseball" —Huh—That may be the object, but the result'll likely be a riot.

Heard At the Dance

"I love your funny step;
Come on—let's start her."
"Funny step, heck,
I'm losin' my garter."

'Tis human to ask for criticism when what we seek is praise.

The Merry Merry

Gosh all heck, how the time does flit—flit—
With Xmas 'twould appear,
The last one's bills are no more'n paid,
Than another one is here.

No—Take a Quick Dip and Get Out

Etiquette hint in English press—"Never break your bread or roll in your soup."

Tuff On Paw and Maw

"My parents are in jail,
I'll never wed," said he.
She said, "Gosh, that's all right,
That's where mine should be."

'Tis but a short span from puppy love to a dog's life.

Where once he caught her in his arms—he now catches her in his pockets.

Man's greatest fear is that the secret of success is work.

We venture to ejaculate that there's many a halfback in football who's all the way back in his studies.

Bold Hussy

"Soon's I stop the car,
I'll kiss you, Miss Dakes,"
She said, "Oh, three cheers
For the four-wheel brakes."

Temptation seeks the company of loafers.

Don't It Get Your Nan?

Good gosh, the worst has came,
It drives one to dispaih—
No matter what you say,
Their one come-back is "Y-E-A-H?"

There's no game "Tom Thumber" than politics.

"Fastenings"

An analysis of assembling methods in fourteen different industries where hardened metallic drive screws are used, has been made by the A. C. Nielsen Co., and the results published in a booklet which is being issued by the Parker-Kalon Corporation, Dept. E, 192 Varick Street, New York, N. Y. The text contains a description of the operation with details as to the methods formerly employed, present method, cost data, and savings. A copy of the book will be sent without charge to any plant executive who sends in a request on his firm letterhead.

Victor Tap Bulletins

The Landis Machine Co., 500 Church Street, Waynesboro, Penna., has issued two bulletins describing and illustrating the Victor Receding Chaser Collapsible Taps and the Victor Collapsible and Solid Adjustable Taps. These bulletins describe in detail the working parts and operation of the taps, and discuss the types of jobs upon which they can be used to advantage. Copies will be sent without charge to any machine shop executive.

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ROOM with BATH $3.00
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AMERICAN and EUROPEAN PLANS
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The largest and longest on the Boardwalk. Occupying an entire city block directly facing the ocean. The foremost point at sea, in
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Concerts Daily
ATLANTIC CITY

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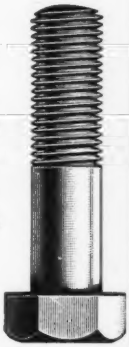

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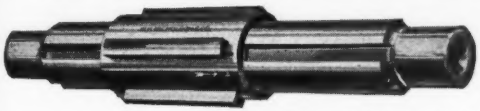

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Hundreds of purchasing agents and engineers have written for details . . . asking how this test could be made in their own plant. So great has been the interest that we have decided to make the method available to all users of reamers and drills. We asked a well known firm of investigating engineers to draw up a series of simple forms which could be used in recording facts and figures necessary in making the test. From this information, the cost-per-hole reamed can be quickly calculated. You can compare Peerless Reamers (or Cle-Forge Drills) with any other make . . . on any job in your shop . . . and with no interruption in regular production. The cost-per-hole test is simple—the results positive and conclusive.

Complete test forms are now ready for distribution. They will be mailed free of charge and without obligation to purchasing agents and production executives who request them.

The coupon is for your convenience. Clip it and mail it today.

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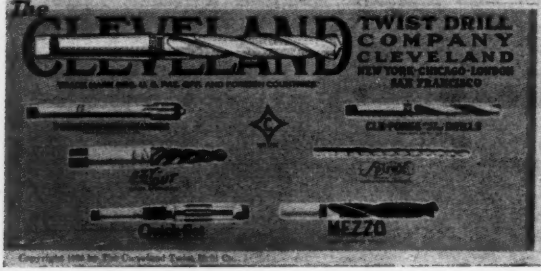

☐ Without obligation you may send us complete forms for making the cost-per-hole test with Spirex Taper Pin Reamers ☐ or Peerless High Speed Reamers ☐ or Cle-Forge High Speed Drills ☐ (specify which).

☐ Send Digest No. 75 too.

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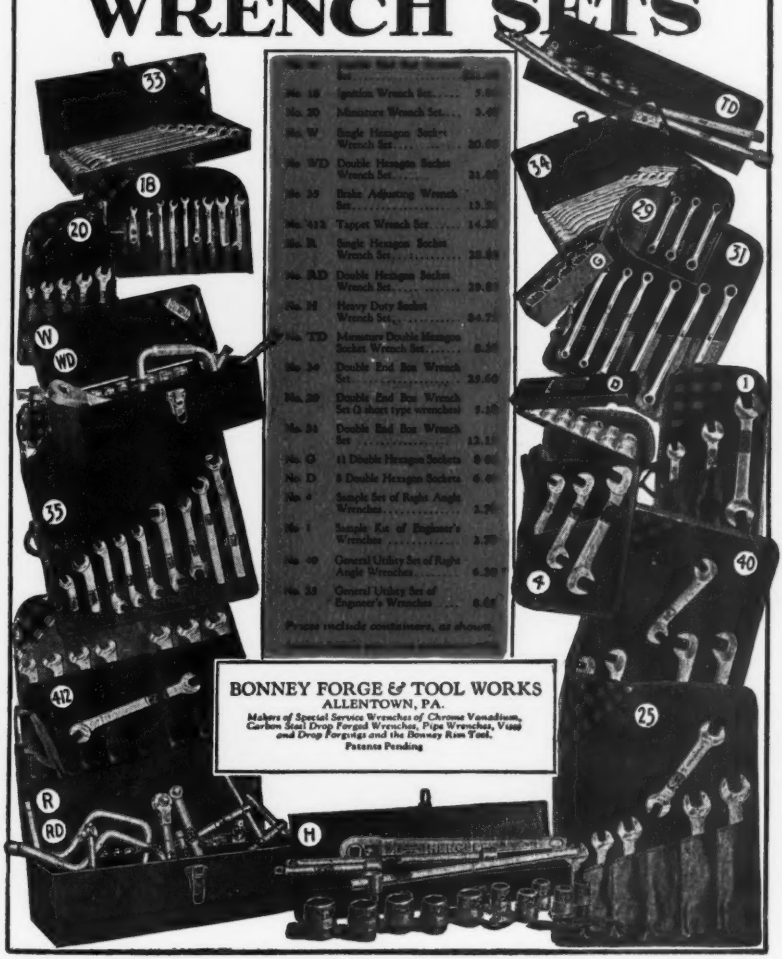

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No. 18	Ignition Wrench Set	5.00
No. 20	Miniature Wrench Set	3.40
No. W	Single Hexagon Socket Wrench Set	20.00
No. WD	Double Hexagon Socket Wrench Set	31.00
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No. 34	Double End Box Wrench Set	25.60
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No. 31	Double End Box Wrench Set	12.15
No. G	13 Double Hexagon Sockets	8.00
No. D	8 Double Hexagon Sockets	6.40
No. 4	Sample Set of Right Angle Wrenches	2.75
No. 1	Sample Set of Engineer's Wrenches	2.75
No. 40	General Utility Set of Right Angle Wrenches	6.50
No. 25	General Utility Set of Engineer's Wrenches	8.00

Prices include containers, as shown

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ALLENTOWN, PA.

Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Pipe Wrenches, Vises and Drop Forgings and the Bonney Ream Tool.

Patents Pending

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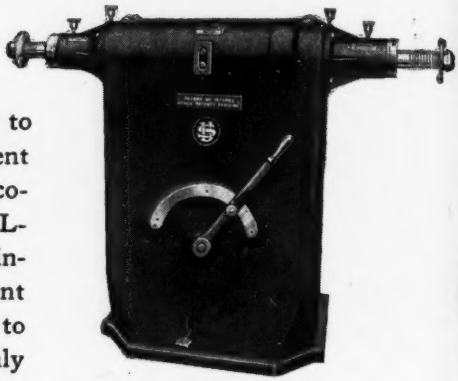

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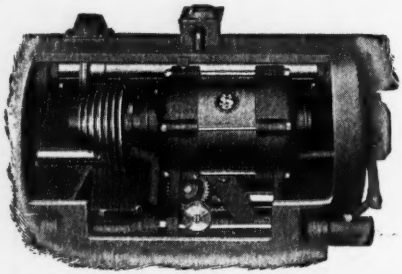
NOW is the logical time to replace obsolete equipment with more profitable, more economical machines. U. S. MULTISPEED BUFFERS, for instance, provide four different buffing speeds from 2,000 to 3,000 r.p.m. They are the only buffing machines embodying the patented Gibbs V-Disc Transmission of GRAPHITIZED MICARTA—the drive which is more efficient, more economical in replacement cost, easily accessible, quiet and durable under severe usage.



(Pat. No. 1477052. Other Pats. Pend.)

U. S. VARIABLE SPEED GRINDERS, too, are the only grinders embodying this drive. These machines maintain a constant wheel surface speed clear down to the flanges, regardless of wheel wear!

Ask your jobber about these modern, ball bearing machines, or ask the U. S. branch in your city, or write us today.

The UNITED STATES ELECTRICAL TOOL CO.

Oldest Builders of Electric Drills, Grinders and Buffers in the World

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Canadian Division—MAPLE LEAF ELECTRIC TOOLS, Ltd.— Toronto